

## Conflicting Values of Inquiry

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# Conflicting Values of Inquiry

*Ideologies of Epistemology in Early Modern Europe*

*Edited by*  
Tamás Demeter, Kathryn Murphy  
and Claus Zittel



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# Values, Norms and Ideologies in Early Modern Inquiry: An Introduction

*Tamás Demeter*

Early modern epistemic discourses were heated by an intense competition of various ideals of intellectual activity, not exclusively in the field of epistemic values, but also in those of artistic, moral, and religious ideals; and not merely theoretically, but also with respect to actual practice. How to produce knowledge, how to understand what had been produced, and questions concerning useful and legitimate ways of applying the knowledge thus gained were central issues.

Knowledge-making practices have always been accompanied by answers to such questions that one could aptly call *ideologies*: that is, more or less explicit ways of making sense of these practices, justifying their relevance, and circumscribing the sphere of legitimate inquiry and applications. Since ancient times, natural inquiry had been driven by the need to make the world intelligible. The standards of *intelligibility*, however, were under constant revision in the early modern period, and consequently knowledge claims underwent a process of continuous re-evaluation. The Baconian ideology of knowledge production put an increased emphasis on the *usefulness* of knowledge alongside its moral *goodness*.<sup>1</sup> These values—intelligibility and usefulness—bring to the fore the relations of abstract ideas (e.g., of methodologies and ontologies) and concrete practices (e.g., of producing and using knowledge). Knowledge produced in various ways was also put to non-Baconian, artistic, and ideological uses too. In these contexts, ideas had a pragmatic significance beyond their literal meaning.

Historical research in previous decades has done a great deal to explore the social and political context of early modern natural and moral inquiries. It has revealed in many ways how theories were embedded in contexts of

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1 On intelligibility and usefulness as ideologies of modern science see e.g. Dear P., *The Intelligibility of Nature: How Science Makes Sense of the World* (Chicago: 2006). On the moral character of natural philosophy see e.g. Gaukroger S., “The Persona of the Natural Philosopher in the early to mid Seventeenth Century”, in Condren C. – Gaukroger S. – Hunter I. (eds.), *The Philosopher in Early Modern Europe: The Nature of a Contested Identity* (Cambridge: 2006) 17–34, and more recently Corneanu S., *Regimens of the Mind: Boyle, Locke, and the Early Modern Cultura Animi Tradition* (Chicago: 2011).

non-epistemic values, and reconstructed on several planes their non-epistemic content and pragmatic relevance. As a result, we have ingenious and revealing narratives about theories put forward in epistemic contexts as attempting to reach certain social goals and bearing on ideological conflicts. At the same time, the epistemic content of inquiry has been frequently relegated to a secondary role.

Particularly since Simon Schaffer and Steven Shapin's *Leviathan and the Air-Pump* (1985),<sup>2</sup> which exposed the political and religious commitments and purposes underlying the debate between Robert Boyle and Thomas Hobbes on the experimental method and the existence of a vacuum, we have become accustomed to studies which attribute epistemological stances and debates to clashes of political and theological ideologies. The worth of such studies, revealing the ways in which texts apparently organized with an eye on epistemic values and virtues did in fact serve social and political aims and motivations, is not here in question. The present volume suggests that with an awareness of this context, it is now worth turning back to questions of the epistemic content itself.

The contributors to the present collection were invited to explore how certain non-epistemic values had been turned into epistemic ones, how they had an effect on epistemic content, and eventually how they became ideologies of knowledge playing various roles in inquiry and application throughout early modern Europe. These ideological conflicts reflected the fact that the list and hierarchy of the various values attached to knowledge-making practices were also unstable, and were coupled with a similar instability in how the proper methods of inquiry were conceived, and how their results could be turned into practice. By the end of the period, as Peter Dear has argued, the Baconian ideology of instrumental utility emerged at the top of this hierarchy; it is still the dominant one today.<sup>3</sup> But this outcome was not inevitable, and early modern inquiry was not homogeneous: it was a gradual process at the end of which instrumentality proved to be triumphant. And although this ideology is dominant in modern science, its eventual triumph was preceded by a clash of diverse ideologies also present in Bacon, among the members of the Royal Society, and indeed, throughout the scholarly communities of Europe.

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2 Schaffer S. – Shapin S., *Leviathan and the Air-Pump: Hobbes, Boyle and the Experimental Life* (Princeton, NJ: 1985). On its afterlife and impact see idem, “Up for Air: *Leviathan and the Air-Pump* a Generation on” in the new edition (Princeton, NJ: 2011) xi–l.

3 Dear P., “What is the History of Science the History of? Early Modern Roots of the Ideology of Modern Science”, *Isis* 96 (2005) 390–406.

Competing values profoundly influenced the understanding of the knowledge that had been produced, and the ways in which boundaries between legitimate and forbidden ways of applying theoretical knowledge were drawn. If one thought, for example, that the task of natural philosophy was to explain the material world in terms of purely mechanical processes, because that is how inert matter should work, then one would naturally respond to the question of whether Newton's natural philosophy was correct by responding that only his mathematics was accurate, and nothing else—as did Huyghens in a widely cited letter responding to an enquiry from Locke.<sup>4</sup> Clearly, it is not instrumentality that motivates Huyghens's response in this case: he was not satisfied with empirical adequacy necessary for the manipulation of the natural world, because his primary aspiration was to be found elsewhere, namely in intelligibility by his own standards.

Nothing illustrates the strength of this way of making sense of the world better than the fact that even Newton himself tried to explain his theory by the standards of Cartesian mechanism—that is, standards corresponding to Huyghens's preference. And upon realizing that it was impossible he decided, as Imre Lakatos aptly put it, to change the standards instead.<sup>5</sup> By doing so, Newton took on ideological work: he would revise the standards of intelligibility and the standards by which epistemic value is judged. A crucial monument of this ideological work is his “Fourth Rule for the Study of Natural Philosophy,”<sup>6</sup> which effectively proclaims that metaphysical reasoning must not be allowed to force us to reject inductive evidence. This is part of what Eric Schliesser has termed as ‘Newton's challenge to philosophy’, an epistemically relevant ideological change indeed.<sup>7</sup>

Gradual transformation in the ideologies of inquiry can be explored in moral philosophy as well, including what many early modern philosophers called ‘the science of man’. Several moral theories were put forward with an emphasis on their role in settling questions of political legitimacy, as in Thomas Hobbes, or in providing a theological *cum* teleological understanding of man as in Joseph Butler. Of course, moral philosophy was also presented as an inquiry capable of providing a firm foundation for morality in various ways, as in the works of Carmichael, Grotius, Pufendorf, and Hutcheson, but subsequently it would be

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4 Dear, *The Intelligibility of Nature* 26–27.

5 Lakatos I., “Newton's Effect on Scientific Standards”, in idem, *The Methodology of Scientific Research Programmes. Philosophical Papers 1* (Cambridge: 1978) 193–222.

6 See Newton Isaac, *Philosophical Papers* (Cambridge: 2004) 89.

7 Schliesser E., “Newton's Challenge to Philosophy”, *HOPUS: The Journal of the International Society for the History of Philosophy of Science* 1 (2011) 101–128.

represented as a value-neutral inquiry instrumental in improving society, particularly in the hands of David Hume and Adam Smith. These different sets of values shaped the methods of moral inquiry and the styles of argument; they set and revised the boundaries of its proper field, prescribed the legitimate ways of drawing inferences and using evidence, fixed premises to start from and the kinds of evidence to rely on, and constantly re-defined the purpose and function of moral inquiry itself.

Various visions of how knowledge should be produced and used naturally influenced the image of a man of science. Different ideologies of knowledge-production entailed different views on the virtues one should possess in order to be someone taking part in the production of knowledge. Virtues required in inquiry went through considerable change during the period. On the one hand, the emerging new disciplines did not fit traditional classifications of knowledge, based on the Aristotelian *habitus intellectuales*, and required new foundations in different powers and virtues of the mind. On the other hand, new knowledge-making practices placed emphasis on previously unknown or disregarded virtues. Here one can think of Copernicus following his path with an eye on *aesthetic* values like the *uomo universale*,<sup>8</sup> or of the role that the values of courtiers, artisans, and gentlemen played in the spread and development of experimental practices. It took a gradual process in which the credibility and other epistemic virtues of a specialist replaced those of a *virtuoso* naturalist, and in which the ideal of the moralist gave way to the detached and impartial observer of human nature and society.<sup>9</sup>

This development, however, should not overshadow the fact that the study of nature typically had an intrinsic moral agenda. As recent literature and several contributors in the present volume suggest, epistemic and moral content were intertwined in early modern natural philosophy making it also an ethical pursuit of the cultivation of *habitus*. As Sorana Corneanu has recently argued, natural philosophers in the period frequently represented their project as an enterprise for perfecting the human mind. This stance lends a much broader

8 On the influence of Copernicus's heritage in the early modern period see Neuber W. – Rahn T. – Zittel C. (eds.), *The Making of Copernicus: Early Modern Transformations of a Scientist and His Science* (Leiden: 2015).

9 Centrally important works on this process include: Biagioli M., *Galileo, Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: 1993); Shapin S., *The Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: 1994); Roberts L. – Schaffer S. – Dear P. (eds.), *The Mindful Hand: Inquiry and Invention from the Late Renaissance to Early Industrialisation* (Chicago: 2008). On the development of the ideals of impartiality and objectivity in the period see Murphy K. – Traninger A. (eds.), *The Emergence of Impartiality* (Leiden: 2014).

significance to claims of utility than a purely instrumental understanding would suggest, and reveals the moral import of theories that underlies their epistemic content.<sup>10</sup>

The present volume elaborates on these various manifestations of early modern ideologies of knowledge through a series of historical case studies. As Peter Dear points out in his paper, 'prominent epistemic themes of the period ran through many different modalities of philosophical representation', which prevents the topic to be discussed from a unitary perspective. As a consequence, the papers derive methodological inspiration from various sources. Besides the received methods of intellectual history, perspectives derived from historical epistemology and the sociology of knowledge also inform some of the papers.

The volume begins with Peter Dear's case study, which cuts across various themes subsequently discussed in other contributions. Starting from an evaluation of what the sociology of scientific knowledge has achieved in the past decades, Dear introduces the problem of interconnecting epistemic categories and their interplay with extra-theoretical contexts and considerations in the political scene. He argues that the proper approach to the uses of epistemic themes in the period is to treat them as intrinsically interconnected, as exemplified in Descartes, Hobbes, Chauvin, and the Scholastic tradition. He illustrates this thesis particularly through Robert Hooke's 'attempt to materialize ontological categories', including those of the intellect, by translating the latter into the mechanical idiom. Subsequent papers discussing various aspects of similar interconnections are grouped into six sections.

The first section considers the role that early modern engineering and technical devices played in the transformation of epistemic values. Matteo Valleriani explores the interconnection between a field of practical knowledge production, namely military engineering, and natural philosophical discourses. He argues that sixteenth-century Italian engineers and practical mathematicians developed new anti-Aristotelian conceptions of matter whose process of theoretization reflects both the tradition of commentary literature on ancient authors and the emerging practice of systematic references to 'repeatable practical experiences'. The tension between the values of the two practices was constitutive in epistemic developments connected to the requirements of early modern warfare and court society. Dániel Schmal focuses on how the *camera obscura* came to play a formative role in the 'Cartesian paradigm of cognition'. Given the socio-cultural context in which the device was prominent, Schmal argues that it is the device's capacity to reconfigure the information

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10 Corneanu, *Regimens of the Mind*.

it receives, rather than its indirect representational capacities, that actively contributed to the emergence of the Cartesian ideal of a cognitive individual. Schmal emphasizes the *reliability* ascribed to the perceptual knowledge that the *camera obscura* produces, and downplays its significance as a model of seeing. The *camera* thus turns out to be an instrument that incorporates 'a set of values and ideological motivations inherent in the *practice* of modern science'. Thus understood, the epistemic role of the *camera* is to be found in the context of testimony and the production of new facts through contrived experience—the central problems of the next section.

The second section is devoted to a central problem of early modern social epistemology, namely testimony—a field where epistemic, social, and moral values are perhaps most intrinsically connected. John Henry explores the debate between John Locke and John Sergeant, and argues that while Locke tailored his individualistic epistemological principles to the requirements of religious tolerance, Sergeant's Catholicism drove him to downplay individualistic and personal interpretations of Scripture and emphasize the role of accredited figures in the production and transmission of knowledge. Thus Sergeant can be read as an early social constructivist challenging individualistic epistemologies. Falk Wunderlich emphasizes the central role testimony came to play in epistemological discourses of both science and religion, and he points out that the 'early modern reluctance about testimony' is due to its close association with religious knowledge claims that undermined its general epistemic value in the eyes of several Enlightenment thinkers. In this context, he takes a closer look at the philosophical tenability of the only exception David Hume allows to his universal ban on the acceptance of miracle reports, namely the case of unanimous testimony of a large number of witnesses. Wunderlich argues that for Hume not even this exception can make knowledge claims legitimate in religious contexts, because such miracles are to be incorporated into a general framework of natural laws and should thus be withdrawn from the realm of religious knowledge claims.

The next section immerses us further in questions of how values and norms associated with religion entered into various disciplines and were related to epistemic discourses. Giora Hon argues that, in contrast with received wisdom, Kepler's *Astronomia nova* plays a more prominent role in the transformation of medieval into modern science than Copernicus's *De revolutionibus*. Hon argues that Kepler's theology of unity is the key to understanding his achievement: Kepler's 'comprehensive view of the world', which unites geometry, physical explanation, and observation, is granted by an 'overarching theological perspective'. What Kepler achieved in the process of unification disappeared from view due to contradictory historiographies that failed to



appreciate it as a comprehensive view of the world that sprang from theological roots. Tamás Demeter's paper is focused on David Hume's discussion of providence and wonders, and argues that he challenges the cognitive authority of both revealed religion and natural theology. These passages are to be read as undermining early modern aspirations to lend theological legitimacy to natural inquiry, and also as gesturing toward a secular ideology of modern science. János Tanács argues that the emergence and development of non-Euclidean geometries, and eventually János Bolyai's achievement, was intertwined with the social values characteristic of the intellectual milieu of the Protestant parts of eighteenth-century Hungary, a milieu whose interest in the Problem of Parallels can be aptly contrasted with the indifference to such questions in the Catholic parts. Tanács's paper illuminates the transmission of certain religious and social values into the realm of mathematics by showing how conflicting values played a selective role in setting the boundaries of theoretical controversies in the context of both positive and negative reception.

The papers in section four extend the discussion on the role of controversies in shaping epistemic values beyond the sphere of religion to natural and civil philosophy. Gábor Zemplén discusses Newton's 'strategic manoeuvring' in the controversy ensuing from the publication of his "New Theory of Light and Colours". Zemplén interprets Newton's argumentative strategy as aiming at minimizing the possibility of rejection and maximizing social credit. In effect, this strategy turns out to be channelling queries and challenges so as to help him to adjust the scope of his optical enterprise when facing challenges, and to facilitate the conversion of potential followers. Axel Gelfert argues that Hobbes's commitment to the value of geometrical reasoning as a means of generating assent in both natural and civil philosophy was an important source of controversy between him and the leading mathematicians of his time. In Gelfert's reconstruction, Hobbes's insistence on his core and controversial beliefs about geometry despite superior arguments is due to certain, and for him unwelcome, methodological consequences with respect to the value of demonstrative reasoning in the field of civil philosophy. Gelfert concludes that Hobbes's insistence on his mathematical opinions violates his own precepts against intolerable stubbornness in society.

Section five continues the discussion of epistemic values and virtues associated with the study of man and society in the field of a characteristic eighteenth-century discipline, the 'science of man'. Thomas Sturm argues that the various attempts to transfer the method of analysis-synthesis, i.e. the ideal methodology of early modern natural philosophies, to the human sciences proved to be futile. After exploring various attempts to adopt this methodological ideal in the human sciences, Sturm concludes that the failure of such attempts is

partly due to some central methodological values of contemporary natural philosophies that constrained acceptable inferences, and thus the established epistemic values of natural inquiry could not be effectively adopted by authors working in relative isolation. Eric Schliesser reconstructs three intellectual traditions that Hume invokes at various places in his *oeuvre* as the sources of his 'science of man'. The changes between them, Schliesser argues, reflect changes in Hume's understanding of the epistemic virtues underlying his project, and the evolution of his vision on the place of a 'science of man' in the system of sciences.

The final section broadens the discussion from epistemic virtues to moral ones, and illustrates the fundamental significance of ethics for early modern epistemology. Sorana Corneanu explores the central role charity plays in Bacon's programme for the reformation of learning. Corneanu argues that charity for Bacon is not restricted to the outcome of the pursuit of knowledge, but has a wider scope: the fruitfulness of knowledge has various forms in natural inquiry itself and in the process of transmitting knowledge. These fruits rest on a number of epistemic virtues that are counterparts of moral-religious virtues, and they can be aptly taken to constitute the fruits of charity. Ruth Lorand argues that Spinoza's attempt to derive values from nature failed, and for this reason he also failed to ground his vision of the ideal life on metaphysics. Instead, Lorand argues, Spinoza in fact derived his metaphysics starting with his ideal of man in mind, and it was through this ideal that he conducted his inquiry into nature, and not the reverse way. Spinoza's account of natural phenomena is thus a value-driven enterprise from its outset. Catherine Wilson's contribution offers an alternative to the view that Kant's project is a descriptive enterprise aiming to explain the mind's contribution to experience. Starting from Kant's own account of his project, Wilson argues that it is revisionary with certain ideological overtones: he joins metaphysics to morals with the intention of criticizing the perspective adopted by many of his Enlightenment contemporaries. On this reading, Kant's metaphysics of nature, combined with his metaphysics of morals, was motivated by Kant's anti-scientism, rigorism, and a teleological understanding of history, and it was eventually wielded against the relativistic, observational anthropology practiced in France, Germany, and Scotland.

It is hoped that the case studies in the present collection will prove to be useful and inspiring contributions to discussions centred on the role values, virtues, and ideologies played in various fields of early modern knowledge production. Indeed, the volume as a whole drives towards the study of those values, norms, and standards that unify knowledge-making practices, which

otherwise, from the perspective of different disciplinary canons, may easily seem to be entirely disjointed.

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# Reason and Common Culture in Early Modern Natural Philosophy: Variations on an Epistemic Theme

*Peter Dear\**

[T]his is certain, seeing *right reason* is not existent, the reason of some man or men must supply the place thereof

—THOMAS HOBBES, *De corpore politico*

## Summary

What did philosophers argue about in early-modern Europe, and in what terms did they do it? Prominent epistemic themes of the period ran through many different modalities of philosophical representation. Sorting out topical registers for a distant historical culture is, of course, far from straightforward. Quentin Skinner spoke of recognizing particular ‘activities’ in the history of European political thought at widely different periods as a *sine qua non* for his own historical specialty. While there are good grounds for saying that early-modern speculative natural philosophy certainly was not the same activity as modern science (itself not a single activity), a genetic, or genealogical, link surely exists between important elements of the game of natural philosophy in the seventeenth century and elements of our modern games of science. Understanding the various uses of epistemic themes in different periods involves drawing links between many different categories of activity, not treating them as necessarily alienated from one another. This paper considers the specific themes of ‘reason’ and ‘matter,’ and looks particularly at how Robert Hooke combined the two in some of his speculations on the workings of the human brain.

## 1

In placing the emphasis on ‘epistemological and moral values’ in philosophical debates of the early modern period, this volume brings into view complexities

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\* The author would like in particular to acknowledge the useful suggestions of an anonymous referee.

and subtleties that are allegedly overlooked when such commitments are 'extrapolated onto the political or social plane'. I want first of all, therefore, to review what I take to have been the point of work, canonically Shapin and Schaffer's *Leviathan and the Air-Pump*, that emphasized analyses indebted to the sociology of knowledge in examining philosophical disputes.<sup>1</sup> If we fail to appreciate fully what that work achieved, we may risk throwing out the baby with the bathwater when attempting to elaborate other sorts of accounts.

Central to the ssk (Sociology of Scientific Knowledge) heuristic was the tenet that ideas cannot be explained by reference to other ideas; that ideas have no kind of causal force, and that in any case accounting for ideas as consequences of other ideas disregards the doctrine of finitism, according to which extensions of categories to include new members cannot be determined by appropriate general definitions of those categories themselves. Ideas, as the presumed elements of 'knowledge', need to be understood, or accounted for, in terms of something other than themselves.<sup>2</sup> Part of the inflammatory rhetoric involved precisely the talk of 'knowledge' in this connection; much the same points can be made by talking about 'belief' instead, but there was an epistemological aspect to the approach that denied that knowledge itself might be anything other than situated belief. The distinction may be of greater concern to philosophers than to historians of science: the former might want to comment on whether any particular belief or argument was actually correct or properly justified, and only under those circumstances to count it as knowledge. I take it that such matters are not at issue in the present discussion.

The basic ground-rule of this approach was, therefore, always to account for what each side argued in a philosophical dispute in terms of what winning or losing the dispute would mean to the participants: in other words, what was at stake for them in the dispute. Furthermore, as Steven Shapin argued vigorously, the historian really only has access to what historical actors said (or wrote), not to some imagined state of 'real belief'.<sup>3</sup> Taken literally and completely, that position cannot hold, of course, since so much must be assumed in interpreting the meaning of an utterance, but Shapin's general tendency seems

1 Shapin S. – Schaffer S., *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: 1985). See now also the new edition, with a valuable retrospective introductory essay (Princeton: 2011).

2 Cf. Bloor D., *Knowledge and Social Imagery*, 2nd ed. (Chicago: 1991 [1976]); Barnes B. – Bloor D., "Relativism, Rationalism and the Sociology of Knowledge", in Hollis M. – Lukes S. (eds.), *Rationality and Relativism* (Cambridge, MA: 1982) 21–47.

3 Shapin S. – Barnes B., "Darwin and Social Darwinism: Purity and History", in Barnes B. – Shapin S. (eds.), *Natural Order: Historical Studies of Scientific Culture* (London – Beverly Hills: 1979) 125–142; Shapin S., "Of Gods and Kings: Natural Philosophy and Politics in the Leibniz-Clarke Disputes", *Isis* 72 (1981) 187–215.

clear: in making sense of ideas in the history of science and philosophy, one should always, as a matter of historiographical practice, determine what those ideas or 'knowledge' mean in relation to their local situations of use, and not in relation to their supposed intrinsic meaning in relation to other, similarly disembodied, ideas. Thus, in *Leviathan and the Air-Pump*, the significance of Boyle's experimentalism and of Hobbes's nominalist deductivism are assessed in terms of the kind of social relations, or the kind of polity, that renders those philosophical arguments effective, or that accommodates them.

So this kind of argument is not one that simply displays isomorphisms, structural similarities, between systems of thought and socio-political systems; instead, it concerns the contexts of use of certain kinds of arguments and practices. To that extent, issues regarding the moral or metaphysical commitments of historical actors are portrayed as slightly beside the point, because the emphasis is placed, not on their philosophical commitments, but on significances that are *categorically distinct*: ideas are not things to be explained in terms of other ideas (since these are taken to have no causal powers), but in terms of the acts and actions that they facilitate. And those acts and actions are desirable to the relevant historical actors due to such instrumental concerns as the pursuit of political arrangements or of other sorts of social interest, or else due to their facilitating of material manipulations of whatever kind.<sup>4</sup>

That is what I take to be the classic Edinburgh ssk position of the 1980s, particularly as it was expounded by Steven Shapin, and as it is represented in *Leviathan and the Air-Pump*. Our present question is then one of deciding what relationship that perspective on understanding in the history of ideas (alluding to Quentin Skinner's originary focus) might have to other sorts of intellectual contextualisms, such as those to do with ethics or metaphysics in relation to natural philosophy.<sup>5</sup> The problem here is that, by contrast, the ssk endeavour purported to provide understanding in the history of ideas that was *not* centrally about contextualism of an intellectual sort, nor about isomorphisms between theoretical or methodological structures and theorized political structures. In fact, to the extent that ssk cared at all about intellectual isomorphisms, it only cared about them as routes of approach to the practical uses—centrally, situated speech-acts—that were its real explanatory items.

This volume's concern with 'different sets of values' in their relations to various intellectual commitments, as for example the theological concerns

4 Shapin S., "Homo phrenologicus: Anthropological Perspectives on an Historical Problem", in Barnes – Shapin, *Natural Order* 41–71.

5 Skinner Q., "Meaning and Understanding in the History of Ideas", *History and Theory* 8 (1969) 3–53; cf. Austin J.L., *How to Do Things With Words*, 2nd ed. (Cambridge, MA: 1975 [1962]).

of Newton or Leibniz in relation to their metaphysics, thus effectively implicates Shapin's ssk approach to the Leibniz-Clarke dispute: Shapin wanted to show that the dispute was about Newton's fear of Leibniz joining the new Hanoverian court in Britain, and thus displacing Newton from his pre-eminent position as national philosopher.<sup>6</sup> From Shapin's point of view, the ostensible philosophical and theological positions under dispute were more like tokens in a game than the stakes of the game itself—because any competent practitioner of ssk knew that ideas and arguments are always fundamentally indeterminate ('interpretive flexibility'), and will therefore always be stalking-horses for something else.

In short, there is a fundamental incommensurability between ssk's questions about knowledge and those of intellectualist history of science and philosophy—an intellectualist history that would seem to include what are usually called 'values'. These are not complementary questions; they are in fact quite different ways of regarding the legitimacy of different sorts of historical questions.

The central means that the project of this volume invites us to use in distinguishing between these two approaches or enterprises is to draw a categorical distinction between 'instrumental' questions and those aimed at 'understanding'. I think that this is a distinction that ssk would have flatly rejected, on the grounds that our historical understanding of why people hold the beliefs they do necessarily involves knowing what they use them for; on this view, the categories are inseparable.

From this there follows a further difficulty, which is that the instrumental use of ideas can be attributed to many different sorts of endeavours: one can even go so far as to say that a particular sort of discourse is used to render more plausible another sort of discourse, which in turn is used to render 'natural' a particular sort of social or political practice. There might even be a further use attached to that facilitated political practice, whereby it promotes yet another sort of discourse. This kind of analysis could in principle go on forever. Since there is, nonetheless, always a point in practice at which analysis has to stop, it might be argued that the whole issue of whether some philosophical debate is fundamentally about social order and politics, or about theology, or ethics, or metaphysics is at root a pragmatic one; in principle, it can always be argued that any such debate is about all of those things, or whichever one of them you particularly want to investigate. In brief, whichever of those directions is

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6 Shapin, "Of Gods and Kings"; Meli D.B., "Caroline, Leibniz, and Clarke", *Journal of the History of Ideas* 60 (1999) 469–486, examines the debate from the perspective of Leibniz's engagement with Caroline's concerns.

favoured, a good case can be made that explaining a philosophical dispute in terms of its political stakes is not fundamentally different methodologically, or even, ultimately, topically from explaining it in terms of its (say) theological stakes. *Leviathan and the Air-Pump* itself employed many different topical registers.

Sorting out topical registers for a distant historical culture is, of course, far from straightforward. Quentin Skinner spoke of recognizing particular ‘activities’ in the history of European political thought at widely different periods as a *sine qua non* for his own historical specialty, but linking together such activities requires understanding of how they interacted in very different cultural settings.<sup>7</sup> For example, in her St. Louis University doctoral dissertation of 1962, Patricia Reif wrote about the norms and commonplaces found in early seventeenth-century scholastic natural-philosophy textbooks. One of these concerned the question of whether Aristotelian prime matter has its own ontological reality, independent of form. Reif found that her authors, in one way or another, argued that it did, and rejected Aquinas’s position that prime matter was simply ‘pure potentiality’.<sup>8</sup> These authors included both Protestants and Catholics, widely used authorities such as Burgersdijk, Oviedo, Arriaga, Eustace of St. Paul, and Daniel Sennert. They all maintained that prime matter has in some sense a reality of its own, and some noted that God, if He wanted to, could create prime matter without any associated form at all. What Reif showed was a tendency towards arguing for the reification of pure, unqualified matter in commonplace scholastic discussions in the early decades of the seventeenth century, a tendency that amounted to the emergence of a shared sensibility rather than the acceptance of a particular technical party line. This sensibility seems to have been prior to, and stood at the core of, whatever arguments were offered in its support.

One of Reif’s textbook authors, Daniel Sennert, is a figure that Antonio Clericuzio and William Newman have each identified as an important source for Robert Boyle’s discussions of corpuscularism in chemical conceptions of matter.<sup>9</sup> Their observation underlines the existence of a sort of common philosophical culture on which seventeenth-century writers drew, and in which they all, to some extent or another, participated—even when, like Boyle, they

7 Skinner, “Meaning and Understanding” 40.

8 Reif P., “Natural Philosophy in Some Early Seventeenth Century Scholastic Textbooks”, Ph.D. diss. (Saint Louis University: 1962) 105–122.

9 Clericuzio A., *Elements, Principles and Corpuscles: A Study of Atomism and Chemistry in the Seventeenth Century* (Dordrecht: 2000); Newman W.R., *Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution* (Chicago: 2006).



were not themselves university men. Although it was riddled with fragmentation and competition, this common culture comprised the principal contested, or else taken-for-granted, epistemic themes in play in this period.<sup>10</sup>

Understanding the various uses of epistemic themes involves drawing links between many different categories of activity, rather than treating them as necessarily alienated from one another. What did philosophers argue about in early modern Europe, and in what terms did they do it? While there are good grounds for saying that early modern speculative natural philosophy was not the same activity as modern science (itself not a single activity), a genetic, or genealogical, link surely exists between important elements of the game of natural philosophy in the seventeenth century and elements of our modern games of science. While prominent epistemic themes of the period ran through many different modalities of philosophical representation, one of them overarched the rest: ‘reason’.

## 2

Reason played a central role in the development of natural philosophy because of its practical use in the establishment of authoritative knowledge claims: a successful appeal to the support of ‘reason’ for one’s philosophical assertions would sweep all before it. As a consequence, much dispute in early modern natural philosophy occurred through the medium of debates on reason, its proper use, and how it was to be recognized. Authority, intellectual or political, often rested on the successful cooptation of this ubiquitous epistemic theme.

A convenient entry point is provided by Descartes’s 1637 “Discourse on the Method of Rightly Conducting One’s Reason and Seeking the Truth in the Sciences”. Descartes’s use of the word *raison* in the “Discourse” usually has it meaning something like ‘judgement’, in contrast to his earlier, unpublished, “Rules for the Direction of the Mind”, in which he had tended to use the Latin word *ratio* in regard to formal inferential reasoning—the mental perception of agreement or disagreement between ideas. Appropriately, therefore, he makes his excuses in the ‘Discourse’: ‘Neither is it my design to teach a Method which every Man ought to follow, for the good conduct of his reason; but only

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10 On epistemic themes (‘epistemics’) in the study of present-day science, see Lynch M., *Scientific Practice and Ordinary Action: Ethnomethodology and Social Studies of Science* (Cambridge: 1993) esp. 280, 300.

to shew after what manner I have endeavoured to order mine own'.<sup>11</sup> Descartes here speaks of his own use of reason as if it were not a capacity (either his reason or his use of it) that gave him some especial standing or credibility. So why should anyone care what this writer (anonymous in the first edition) had to say? Descartes offered at least two arguments for taking what he had to say as valuable: one concerned the kind of person he was, and the other concerned the value of his claims about his method, supposedly displayed by the three succeeding essays published with the "Discourse"—the "Dioptrics", "Geometry" and "Meteorology". First, the way that he accounts for his life thus far makes it clear that he's an *honnête homme*: a gentleman that you can, presumably, believe.<sup>12</sup> He can easily afford his self-deprecation: you don't have to follow his example if you don't want to, but see if his way of employing reason doesn't seem just what a decent fellow might do. And then, secondly, the essays show what he is in fact capable of.

Descartes's need to manage things in this way was due to the rhetorical inappropriateness of his simply saying that he was cleverer than everyone else (which he might well have wanted to do); he had instead to persuade others by flattering their own abilities to agree with him. He could do this, in the present case, because of the imprecision that attended his use of the term 'reason'. Descartes's talk of 'reason' never itself served to clarify matters because it involved a functional imprecision. A later indication of the nicely pragmatic and unanalytical use of 'reason' at play here appears in a widely cited philosopher and lexicographer of the early eighteenth century, the Cartesian Étienne Chauvin. He says in his *Lexicon philosophicum* that according to some leading philosophers the term *ratio* cannot be defined:

For what 'reason' is, they say, is sufficiently known to all of us who are distinguished as being rational people. Neither does it matter that rea-

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11 'Ainsi mon dessein n'est pas d'enseigner icy la Methode que chascun doit fuiure pour bien conduire sa raison, mais seulement de faire voir en quelle forte i'ay tasché de conduire la mienne'.—Descartes René, *Oeuvres de Descartes*, ed. C. Adam – P. Tannery, 11 vols. (Paris: 1996) vol. VI, 4 (*Oeuvres* hereinafter cited as AT and volume number). I follow the contemporary translation of 1649: Descartes René, *A Discourse of a Method for the Well Guiding of Reason, and the Discovery of Truth in the Sciences* (London, Thomas Newcombe: 1649).

12 Cf. Dear P., "A Mechanical Microcosm: Bodily Passions, Good Manners, and Cartesian Mechanism", in Lawrence C. – Shapin S. (eds.), *Science Incarnate: Historical Embodiments of Natural Knowledge* (Chicago: 1998) 51–82; Shapin S., *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: 1994); Jones M.L., *The Good Life in the Scientific Revolution: Descartes, Pascal, Leibniz, and the Cultivation of Virtue* (Chicago: 2006).

son is on many occasions unknown, obscure, perplexed: for it suffices at least to have in whatever circumstances that thorough overview as is called ‘not unknown’: just as the son of a family recognizes his father even though he will not have recognized him when glimpsed at a distance, or in shadow, or in the bustle of debate, or disguised in the clothes of a pilgrim or a woman.<sup>13</sup>

This chauvinist position seems to hold that you know reason when you encounter it, even though there might be accidental circumstances when you might fail to recognize it; nonetheless, there is no difficulty in principle. But Chauvin knows that not all philosophers hold this position; there were other meanings to the word *ratio* than the kind whereby you know it when you see it. The great thing about these various senses was that people often failed to make clear which one they were using in any particular case.

Chauvin’s analogy with recognizing the identity of a person evidently alludes to a well known paradox from antiquity associated with the fourth-century B.C. Megarian school, usually referred to as the ‘veiled figure’. The account of the paradox most similar to Chauvin’s example comes from the Greco-Roman satirist Lucian (second century A.D.), in a passage from his *Philosophers for Sale*:

*Chrysippus*: Next you’re going to hear the quite fascinating Veiled Argument. Tell me, do you know your own father?

*Customer*: Yes.

*Chrysippus*: Well, if I place someone veiled in front of you and ask ‘Do you know this person?’, what will you say?

*Customer*: Obviously that I don’t know him.

*Chrysippus*: But in fact this person is your very own father. So if you don’t know this person, you clearly don’t know your own father.<sup>14</sup>

13 ‘Quid enim sit ratio, aiunt illi, satis superque notum est nobis omnibus, quorum hoc insigne est, rationales esse. Nec referet quod ratio quam plurimis occasionibus ignota sit, obscura, perplexa: nam sufficit eam in aliquibus saltem circumstantiis perspectam habere, ut non ignota dicatur: sicut patrem suum filiusfamilias novit, etiamsi non noverit illum eminus versantem, aut in tenebris aut in conferta hominum huc illuc discursantium turba aut habitu peregrino vel muliebri larvatum’—Chauvin S., *Lexicon philosophicum*, 2nd ed. (1713; facs. reprint. Düsseldorf: 1967) 555, col. 2.

14 ‘ΧΡΥΣΙΠΠΟΣ καὶ ἄλλα γὰρ σε διδάξομαι θαυμασιώτερα—τὸν θερίζοντα καὶ τὸν κυριεύοντα καὶ ἐπὶ πᾶσι τὴν Ἥλεκτραν καὶ τὸν ἐγκεκαλυμμένον [...] Ἥλεκτραν μὲν ἐκείνην [...] ἢ τὰ αὐτὰ οἶδέ τε ἅμα καὶ οὐκ οἶδεν παρεστῶτος γὰρ αὐτῇ τοῦ Ὁρέστον ἔτι ἀγνώτος, οἶδε μὲν Ὁρέστην, ὅτι ἀδελφὸς αὐτῆς, ὅτι δὲ οὗτος Ὁρέστης ἀγνοεῖ. τὸν δ’ αὖ ἐγκεκαλυμμένον καὶ πάνυ θαυμαστὸν ἀκοῦσθαι λόγον. ἀποκρίναι γάρ μοι, τὸν πατέρα οἶσθαι τὸν σεαυτοῦ;

The apparent borrowing of the veiled figure paradox for an identification of 'reason' is not, of course, intended to transfer the paradox; rather the opposite. Aristotle, in his *Sophistical Refutations*, had dismissed the paradox *qua* paradox; he did not quite condemn it as simple equivocation, but he effectively rendered it harmless. The Aristotelian precedent thus allowed the easy appeal to an everyday example in making 'reason' appear self-evident.<sup>15</sup>

Among the other senses of *ratio* that had been routinely employed in the seventeenth century were cause, the capacity for reasoning, mathematical ratio, and (Aristotelian) form (leaving aside the commonly used term *rationatio*, 'ratiocination', to refer to the active *use* of reasoning). The canonical scholastic discussion of these terms, or things, was due to Thomas Aquinas, deriving from Aristotle, *De anima*. Aquinas distinguished between 'intellect' and 'reason', a distinction relating to the process of deductive inference as Aristotle explained it in his logical writings. Formal deduction rested on fundamental principles or premises, most problematically what Aristotle called 'axioms'. These were primitive statements, taken to be true, from which deductive inferences could be drawn: most famously, the sort that mathematicians used, such as Euclid's third (and Aristotle's frequent example): 'If equals be subtracted from equals, the remainders are equal'.<sup>16</sup> Aquinas asserted that the intellect is what allows the intuitive perception of the truth of such a statement; without the function of the intellect, it would be impossible to tell that the statement was true; it could not be demonstrated from simpler statements, because the axiom is itself primitive, but it was necessary to assert its truth so as to ensure the truth of whatever was deduced from it. The positing of the intellect resolved that difficulty. The other mental function, reason, served an analogous purpose: reason enabled the perception that a new, deduced statement followed properly

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ὩΝΗΤΣ ναί.

ΧΡΥΣ. τί οὖν; ἦν σοι παραστήσας τινὰ ἐγκεκαλυμμένον ἔρωμαι "τοῦτον οἶσθα;" τί φήσεις;

ὩΝ. δηλαδή ἀγνοεῖν.

ΧΡΥΣ. ἀλλὰ μὴν αὐτὸς οὗτος ἦν ὁ πατήρ ὁ σός, ὥστε εἰ τοῦτον ἀγνοεῖς, δηλὸς εἰ τὸν πατέρα τὸν σὸν ἀγνοῶν—Lucian, *Vit. auct.* 22 in Long A.A. – Sedley D.A., *The Hellenistic Philosophers*, 2 vols. (Cambridge: 1987) vol. II, 229. Lucian, *Philosophers for Sale* 22, trans. in ibidem vol. I, 227; see also Diogenes Laërtius, *Lives*, s.v. Euclides, attributing the paradox to another Megarian, Eubulides.

15 The general paradox is discussed in Aristotle's *Sophistical Refutations* ch. 24.

16 See Heath's discussion in *The Thirteen Books of Euclid's Elements*, trans. T.L. Heath, 3 vols. (New York: 1956) vol. I, 117–124.

from prior accepted statements—reason enabled one to see that some conclusion ‘just follows’ from its already established premises.<sup>17</sup>

This Aristotelian use of ‘intellect’ and ‘reason’, as passed through the Thomistic pedagogical tradition, was ubiquitous in the manuals and textbooks of the sixteenth and seventeenth centuries. Naturally, a version of it appears in Descartes. The seventh of his ‘Rules’ stresses the mind’s intuitive grasp of foundational axiomatic truths, as in mathematics, and then explains how a process of movement through an entire formal deduction should be understood:

I shall run through them [the steps of the deduction] several times in a continuous movement of the imagination, simultaneously intuiting one relation and passing on to the next, until I have learnt to pass from the first to the last so swiftly that memory is left with practically no role to play, and I seem to intuit the whole thing at once.<sup>18</sup>

On this view, the operation of human reasoning is not straightforward and automatic. As Descartes had also stressed in the ‘Discourse’, the movement (here one of the imagination, not of ‘reason’ itself) through the steps of the deduction needs to be disciplined by method, albeit a method sanctioned by the thoughtful intuitions of reason itself.

Descartes’s advice aims at showing how to achieve certainty and conviction in deduction, rather than how to convince others of a proof’s validity. Deductive reasoning reduces to brute intuition—in its most primitive form, to the irreducible leaps from accepted statements to a new, derived one. These leaps just have to be seen; nonetheless, the perception can be improved by training one’s capacity to encompass an entire deductive sequence as if it were a single intuitive act.<sup>19</sup>

Descartes’s originality in these views may be judged by an examination of a widely known philosophical lexicon from 1613. Rudolph Goclenius was a professor of philosophy at the University of Marburg; this lexicon is dedicated to

17 Gaukroger S., *Cartesian Logic: An Essay on Descartes’s Conception of Inference* (New York: 1989) esp. 43–46, which also considers the various traditions’ associations between the intellect, reason, and the corporeal.

18 ‘Quamobrem illas continuo quodam imaginationis motu singula intuentis simul et ad alia transeuntis aliquoties percurram, donec a prima ad ultimam tam celeriter transire didicerim, ut fere nullas memoriae partes reliquendo, rem totam simul videar intueri [...]’—AT vol. X, 388. Descartes René, *The Philosophical Writings of Descartes*, trans. J. Cottingham – R. Stoothoff – D. Murdoch, 3 vols. (Cambridge: 1985–1991) vol. 1, 25.

19 Cf. Gaukroger, *Cartesian Logic* 50.

the Calvinist Prince Moritz of Hesse-Kassel.<sup>20</sup> Goclenius first gives the Greek equivalent of the word *ratio*, *logos*, and notes its use in four different areas: logic, philosophy, mathematics, and physics. He then goes on to give discussions of its meaning in each of those areas.

The philosophical meaning is the most general: 'ratio' can mean, properly speaking, 'reason' as that which can be said of men; in other words, a capacity for reasoning. More commonly, it refers to particular applications, where it compares and relates things, which apparently even some animals can do.<sup>21</sup> In this sense, it concerns analogies of various kinds. As Goclenius explains, this is the source of the specifically mathematical sense of *ratio*: a 'ratio' is an analogy, or proportionality, between things. But in logic and metaphysics, things become more complicated, and, as befits a Calvinist professor, Goclenius provides a Ramist diagram of appropriate subdivisions of the principal sense in that disciplinary context, which is *ratio* as a 'formal' or else an 'objective' concept or definition.<sup>22</sup> This Ramist exposition does not indicate a particularly doctrinaire confessional line on such questions; Goclenius frequently quotes the usual sorts of authorities, from Aquinas to Scaliger and especially Zabarella. His philosophical universe is cosmopolitan, albeit Christian, not narrowly confessional.

Goclenius approvingly cites in his lexicon the great sixteenth-century scholar J.C. Scaliger's definition of reason: 'Reason is nothing other than the motion of the intellect towards a conclusion.'<sup>23</sup> Goclenius himself put it this

20 Goclenius Rudolph, *Lexicon philosophicum* (Frankfurt: 1613; facs. rpt. Hildesheim: 1964). See Hotson H., *Commonplace Learning: Ramism and its German Ramifications, 1543–1630* (Oxford: 2007) esp. 131–135, 230–231; Graf H.T., "The Collegium Mauritium in Hesse-Kassel and the Making of Calvinist Diplomacy", *Sixteenth Century Journal* 28 (1997) 1167–1180. For the general scholarly context, see Grafton A.T., "Textbooks and the Disciplines", in Campi E. – De Angelis S. – Goeing A.-S. – Grafton A.T. (eds.), *Scholarly Knowledge: Textbooks in Early Modern Europe* (Geneva: 2008) 11–38; Schmitt C.B., "Appendices: The Rise of the Philosophical Textbook", in Schmitt C.B. – Skinner Q. – Kessler E. – Kraye J. (eds.), *The Cambridge History of Renaissance Philosophy* (Cambridge: 1988) 792–804.

21 Goclenius, *Lexicon philosophicum* 955 col. 1. 'Prudence' was also often seen (e.g. Hobbes) as resembling 'reason' in practice, and as being possessed by animals.

22 Ibidem 957.

23 'Ratio nihil aliud est quam intellectus motio ad conclusionem'—ibidem 958, col. 1; cf. Julius Caesar Scaliger's great critique of Cardano's *De subtilitate*, the *Exotericarum exercitationum liber xv* (Paris, Michel de Vascosan: 1557), fol. 389v, in relation to Aristotle's *logos* as 'discourse' (as opposed to *nous* as knowledge of first principles). Goclenius seems to quote from the summary in the volume's index, s.v. "ratio", as 'ratio est motio intellectus ad conclusionem'. Cf. also Jacopo Zabarella, *Opera logica*, 3rd ed. (1597; facs. reprint Hildesheim: 1966) col. 313 ("De methodis").

way: 'Reason [*ratio*] is concerned rather with conclusions than with principles; the intellect rather is concerned with principles'.<sup>24</sup> This, then, is a sense of *ratio* that relates it to the process of reasoning, with the implication that reasoning centrally concerns deduction. At the foundations of the deduction are the starting principles, and at the end of the deduction are the conclusions, just as in the case of proving a geometrical theorem. But *ratio* itself only relates to the conclusions, that is, to the deductive process that generates those conclusions. The starting principles, the premises from which the deduction proceeds, are the province of the intellect, which is evidently different from 'reason', as Aquinas had said. By 'intellect', Goclenius evidently refers to the 'intellective soul', one of the various souls and their subdivisions that were part of standard interpretation of Aristotle's *De anima*.<sup>25</sup> From the point of view of natural philosophy (what was often known, on this specific topic, as 'pneumatology'), the intellect was an intrinsic property of the human mind that accounted for understanding in general. Goclenius says of the intellect that it concerns understanding, or intellection, whether of itself or of things outside of itself.

Hence, where Descartes was to collapse all intuitions together, Goclenius distinguished them into those, due to the 'intellect', which recognized the truth of principles, and those, effected by 'reason', which inferred new statements from prior statements. Much later, at the start of the eighteenth century, the Cartesian Chauvin nonetheless provides what was evidently still a standard representation among the 'Pneumatici': 'Broadly speaking, the intellect as such considers principles, but insofar as [the intellect is taken as] reason, then it is said to be concerned rather with conclusions than with principles'.<sup>26</sup>

In a case of formal, deductive reasoning, then, deduction requires premises or principles with which to start. For a statement such as 'the whole is greater than its proper part', its obvious truth must simply be accepted; you just have to see that it is true. On Goclenius's as well as Chauvin's account, what perceives its obvious truth is the intellect, or understanding. Once the premises or starting principles have been established, reason can go forward by comparing

24 'Ratio circa conclusiones potius quam circa principia occupatur: Intellectus potius circa principia'—Goclenius, *Lexicon* 957, col. 1–2.

25 Cf. Kessler E., "The Intellective Soul", in Schmitt C.B. et al. (eds.), *The Cambridge History of Renaissance Philosophy* (Cambridge: 1988) 485–534; also Park K., "The Organic Soul" in *ibidem*, 464–484, esp. 466.

26 'Nimirum, intellectus qua talis circa principia versatur; at quatenus ratio circa conclusiones potius quam circa principia occupari dicitur'.—Chauvin, *Lexicon philosophicum* 555, col. 2. See also Zabarella, *Opera logica* col. 1280 (commentary on Aristotle *Posterior Analytics*).



different statements to one another so as to generate new statements that lead to deductive conclusions.

But reason could be utilized in better or worse ways. Descartes noticed this at the start of the “Discourse”. Speaking about ‘the faculty of right-judging and distinguishing truth from falsehood (which is properly call’d, Understanding or Reason)’, Descartes says that ‘[...] the diversity of our Opinions, is not, because some are more reasonable then others; but only that we direct our thoughts several ways, neither do we consider the same things.’<sup>27</sup> From this perspective, reason is a kind of artificial device, rather than an innate capacity of the mind.

Or, as Hobbes would write in *De corpore*,

[e]very man brought Philosophy, that is, Natural Reason, into the world with him; for all men can reason to some degree, and concerning some things: but where there is need of a long series of Reasons, there most men wander out of the way, and fall in Error for want of Method, as it were for want of sowing and planting, that is, of improving their Reason.<sup>28</sup>

These are all rather Aristotelian views that contrast quite starkly with the later, characteristically Enlightenment representations of reason as a mental faculty, along with memory and imagination, as it appears classically in D’Alembert’s description in his “Discours préliminaire” to the *Encyclopédie*.<sup>29</sup> Contrast also John Locke’s view in his *Essay Concerning Human Understanding* in 1690:

The word *reason* in the English language has different significations: sometimes it is taken for true and clear principles: sometimes for clear and fair deductions from those principles: and sometimes for the cause, and particularly the final cause. But the consideration I shall have of it here, is in a signification different from all these; and that is, as it stands

27 ‘[...] la diuersité des nos opinions ne vient pas de ce que les vns sont plus raisonnables que les | autres, mais seulement de ce que nous conduisons nos pensées par diuerses voyes, & ne considerons pas les mesmes choses’.—AT vol. VI, 2. Descartes, *Discourse of a Method* 3. See also Kessler, “The Intellective Soul” 534.

28 Hobbes Thomas, *Elements of Philosophy, the First Section Concerning Body, The English Works of Thomas Hobbes*, ed. Sir W. Molesworth, 11 vols (London: 1839–1845) [hereinafter EW] vol. 1, 1. Francis Bacon also spoke of ‘the inadequacy of natural reason’, *The Oxford Francis Bacon*, 15 vols (Oxford: 1985–), vol. XIII, 263 (trans. G. Rees).

29 d’Alembert Jean le Rond, “Discours Préliminaire des Éditeurs (1751)” xvi: *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers, etc.*, ed. Denis Diderot – Jean le Rond D’Alembert. University of Chicago: ARTFL Encyclopédie Project, Morrissey R. (ed.) URL = <<http://encyclopedia.uchicago.edu/>>.



for a *faculty* in man, that faculty whereby man is supposed to be distinguished from beasts.<sup>30</sup>

What Locke says of the English language seems to apply, *mutatis mutandis*, for the other European languages as well. For most of the seventeenth century, not only had reason usually been absent from lists of the mental faculties in philosophical taxonomies, but another, not included by Locke, had routinely appeared instead: the will. The three that were commonly listed, as in the case of Zabarella in the late sixteenth century (following Aristotle), were intellect, will, and memory.<sup>31</sup> Descartes's Rule 7 is notable for treating the role of memory as something to be minimized: 'memory is left with practically no role to play'.<sup>32</sup> If memory could be eliminated entirely, the three traditional Aristotelian faculties of the intellective soul would be reduced to two, the (active) intellect and the will. Whether memory appears or not, however, reason is absent as a mental faculty in either case. Even as late as Chauvin, in the early eighteenth century, the mental faculties are listed, just as they were by Descartes, as comprising just two in number, namely the *intellect* (or 'understanding') and the *will*.<sup>33</sup>

Unlike reason, furthermore, the will need not always demarcate men from beasts, at least according to Blaise Pascal. In the *Pensées*, referring to his mechanical calculator of the 1640s, Pascal observed that '[...] the arithmetical machine creates effects that approach thought more nearly than anything animals do; but it does nothing that might make us say that it possesses will as animals do'.<sup>34</sup> Here, Pascal's term 'la pensée' seems to mean something similar to 'ratiocination'.

30 Locke John, *An Essay Concerning Human Understanding*, ed. P.H. Nidditch (Oxford: 1975 [1690]) 667, i.e. Bk. IV, chap. 17, para. 1.

31 Zabarella Jacopo, *De rebus naturalibus libri xxx, editio postrema* (1606; facs. reprint Frankfurt: 1966) col. 724. Zabarella notes that other commentators, however, regard the memory as not distinct from the intellect.

32 Descartes René, *The Philosophical Writings of Descartes* vol. I, 25.

33 Chauvin, *Lexicon philosophicum* 234 col. 2 (Chauvin is not necessarily specifically following Descartes here). In the *Regulae*, XII, Descartes includes imagination and memory (and sense) as 'faculties', although not specifically *mental* faculties.

34 'La machine d'arithmétique fait des effets qui approchent plus de la pensée que tout que ce font les animaux; mais elle ne fait rien qui puisse faire dire qu'elle a de la volonté comme les animaux'.—Pascal Blaise, *Pensées*, L.741; see Ariew R., "Descartes and Pascal", *Perspectives on Science* 15 (2007) 397–409, and cf. trans. on 408 n.10, with discussion of Pascal on animals as machines, esp. 407–408.

'Faculties' were supposed by definition to be active powers, not just potentialities. Before Locke, and even for some avowed non-Aristotelians such as the Cambridge Platonists, reason was not accounted a faculty in anything but an allusive sense, being more a logical technique than a power of acting; it was certainly not concerned with perceiving Forms in the mind of God.<sup>35</sup> Hence Descartes's attempt to teach a method for using reason. Typically, the fourth and final book of seventeenth-century logic texts was devoted to *methodus*: reason by itself was of little value unless it was utilized properly. Effective ways of reasoning, of ratiocination, were what mattered, and were what made Descartes himself worth listening to. Locke would clarify this picture a few decades later by saying that, in order to link together ideas that cannot be immediately and self-evidently connected at once, the faculty of reason actually performs two offices: it discovers appropriate intermediary ideas, (curiously analogous to the procedure in rhetoric called *inventio*); and it then orders those ideas appropriately so as to construct the chain of inference linking premises to conclusion (perhaps comparable to *dispositio* in rhetoric). Those two offices in effect contributed to what was called 'method' in seventeenth-century logic texts.<sup>36</sup>

Scholastic reason and its offshoots, Cartesian and otherwise, in the seventeenth century tended, then, to be not a faculty but rather an office or even a disciplined practice. Accounting for how reason worked depended on how it was to be used, and on the authority of the user.

### 3

Perhaps the most uncompromising practical position on the nature of reason was presented by Thomas Hobbes, most familiarly in his *Leviathan* of 1651. 'Reason' as a noun did not by itself determine what it meant *to reason*.

35 Hatfield G., "The Cognitive Faculties", in Garber D. – Ayers M. (eds.), *The Cambridge History of Seventeenth-Century Philosophy*, 2 vols. (Cambridge: 1998) vol. II, 953–1002, esp. 956–957, 982.

36 Cf. Dear P., "Method and the Study of Nature", in *The Cambridge History of Seventeenth-Century Philosophy*, vol. I, 147–177. Locke, *Essay* 668 (Bk. IV, chap. 17, para. 2). On these rhetorical terms and their relation to dialectic, an excellent treatment is Jardine L., *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: 1974) chap. 1, esp. 29–35. Zabarella's important discussions of method used the word *ordo* (order) as an effective synonym, emphasizing its role as a way of arranging relevant steps in an argument. See also Ramus Petrus, "Method", in Ariew R. – Cottingham J. – Sorell T. (eds.), *Descartes' Meditations: Background Source Materials* (Cambridge: 1998) 2–7.

Reasoning, or *rationatio*, was, as an act, the wilful operation of reason. As usual, Hobbes expressed himself perspicaciously on the matter:

When a man *Reasoneth*, hee does nothing else but conceive a summe totall, from *Addition* of parcels; or conceive a Remainder, from *Substraction* of one summe from another [...]. In summe, in what matter soever there is place for *addition* and *substraction*, there also is place for *Reason*; and where these have no place, there *Reason* has nothing at all to do.<sup>37</sup>

Consequently, the noun refers to

[...] nothing but *Reckoning* (that is, Adding and Subtracting) of the Consequences of generall names agreed upon, for the *marking* and *signifying* of our thoughts; I say *marking* them, when we reckon by our selves; and *signifying*, when we demonstrate, or approve our reckonings to other men.<sup>38</sup>

This is what is '[...]' meant by the word *Reason*, when wee reckon it amongst the Faculties of the mind'.<sup>39</sup> When incorporated into conduct regulated by the civil law, however, reason became, not a mere faculty of the mind, but something called 'right reason'. But even for Hobbes, reason was not entirely 'mechanical'.

Like Descartes, Hobbes regarded reason a propensity that needed to be subject to proper technique. In *Leviathan*, Hobbes noted the propensity of people to draw absurd conclusions (meaning, in effect, conclusions with which Hobbes disagreed). This was possible because reason did not operate by itself, automatically generating true conclusions: 'Reason is not as Sense, and Memory, borne with us; nor gotten by Experience onely, as Prudence is; but attained by Industry; first in apt imposing of Names; and secondly by getting a good and orderly Method in proceeding from the Elements, which are Names [...].'<sup>40</sup> In sum, '[...] *making of syllogisms* is that we call *Ratiocination*

37 Hobbes Thomas, *Leviathan*, ed. R. Tuck (Cambridge: 1996) 31–32; cf. Jesseph D.M., *Squaring the Circle: The War Between Hobbes and Wallis* (Chicago: 1999); idem, "Hobbes and the Method of Natural Science", in Sorrell T. (ed.), *The Cambridge Companion to Hobbes* (Cambridge: 1996) 86–107. However, Hobbes at times speaks of the will itself being *determined* by reason: cf. Hobbes, *Leviathan* 44, 256.

38 Ibidem 32.

39 Ibidem.

40 Ibidem 35. See also Hatfield, "The Cognitive Faculties" 974.

or *reasoning*'.<sup>41</sup> Hobbes gave priority to the process of reasoning, rather than to the abstract noun 'reason', and justified that priority by reference to the term's origins:

The Latines called Accounts of many *Rationes*, and accounting, *Ratiocinatio*: and that which we in bills or books of account call *Items*, they called *Nomina*; that is, *Names*: and thence it seems to proceed, that they extended the word *Ratio*, to the faculty of Reckoning in all other things. The Greeks have but one word λόγος, for both *Speech* and *Reason* [...]. And the act of reasoning they called *Syllogisme*; which signifieth summing up of the consequences of one saying to another.<sup>42</sup>

'Reason', then, was simply the capacity for reckoning. In calling reason a mental 'faculty', Hobbes reflected Cicero and the tradition of humanist rhetorical practice;<sup>43</sup> he appears to mean by the term not an active power, but the simple act of reckoning. In this sense, his view resembles those (largely Aristotelian) commentators who did not include reason among the faculties: for them too, it referred only to a simple perception of comparison.

In his *De corpore politico* (written under a different title c.1640), Hobbes had concurred, verbally, with the usual notion that there were such things as 'laws of natural reason', or 'laws of nature'. He meant by these expressions natural laws of behaviour, that is, 'natural law' in the legal sense (associated with the Jacobean jurist Edward Coke) rather than in the natural-philosophical sense.<sup>44</sup> Such laws either explicitly reflected written laws and constitutions, or else are tacitly approved by the sovereign when sentences are issued by '[...]' them that judge by their natural reason, whether the same be right or wrong'.<sup>45</sup> As a result, Hobbes treats 'natural reason' in the same way as 'right reason'; there is no real distinction between the two. To escape from the state of nature,

[...] it was necessary there should be a common measure of all things, that might fall in controversy. As for example; of what is to be called right,

<sup>41</sup> Hobbes Thomas, *Of Human Nature*, EW vol. IV, 24.

<sup>42</sup> Hobbes, *Leviathan*, 29.

<sup>43</sup> Skinner Q., *Reason and Rhetoric in the Philosophy of Hobbes* (Cambridge: 1996) esp. 351; Cicero, *On the Nature of the Gods* 3.28. Note that Hobbes's apparently Ciceronian description of reason as a faculty cannot easily be described as Platonist; Bacon speaks of the 'rational faculty' in his introduction to the Great Instauration.

<sup>44</sup> Cf. Hobbes Thomas, *De corpore politico*, EW vol. IV, 227.

<sup>45</sup> *Ibidem*.

what good, what virtue, what much, what little, what *meum* and *tuum*, what a pound, what a quart, &c. For in these things private judgments may differ, and beget controversy. This common measure, some say, is *right reason*: with whom I should consent, if there were any such thing to be found or known in *rerum naturâ*. But commonly they that call for *right reason* to decide any controversy, do mean their own.<sup>46</sup>

So, he asserted, '[...] this is certain, seeing *right reason* is not existent, the reason of some man or men must supply the place thereof [...]', and those men must be those '[...] that have the sovereign power [...]'.<sup>47</sup>

Some years later, in *Leviathan*, Hobbes presented much the same argument, but avoided the blunt assertion that '[...] *right reason* is not existent [...]'. Thus, in arithmetical calculation, certainly '[...] the ablest, most attentive, and most practised men, may deceive themselves, and inferre false Conclusions [...]',<sup>48</sup> but this does not display the non-existence of right reason. Hobbes protests:

Not but that Reason it selfe is alwayes Right Reason, as well as Arithmetique is a certain and infallible Art: But no one mans Reason, nor the Reason of any one number of men, makes the certaintie; no more than an account is therefore well cast up, because a great many men have unanimously approved it.<sup>49</sup>

Hobbes then gently leads his reader to the inevitable conclusion:

And therefore, as when there is a controversy in an account, the parties must by their own accord, set up for right Reason, the Reason of some Arbitrator, or Judge, to whose sentence they will both stand, or their controversie must either come to blowes, or be undecided, for want of a right Reason constituted by Nature; so is it also in all debates of what kind soever.<sup>50</sup>

For most users of the term, the hallmark of right reason was that it supported, and never contradicted, orthodox religious teaching. Robert Boyle made a

46 Ibidem 225.

47 Ibidem.

48 Hobbes, *Leviathan* 32.

49 Ibidem.

50 Ibidem. 32–33. Cf. ibidem 246, where 'right reason' describes one of the means whereby God promulgates His laws, a means that is there identical to 'natural reason'.

distinction between ‘ratio recta’ and ‘ratio hypothetica’, where the latter rests on explicitly hypothetical principles. He acknowledged that the term ‘reason’ itself is usually unclear when people talk about whether some belief ‘conforms’ to reason or not; he insisted that *he* means by that expression that the belief conforms to ‘right’ reason as opposed to the hypothetical kind.<sup>51</sup> Chauvin referred to another distinction, remarking that ‘ratio recta’ is opposed to ‘ratio depravata’, ‘depraved’ reason, and either refers to the sort of reasoning that a properly functioning mind engages in, or, in the case of ethics, to the sort that produces salutary conclusions.<sup>52</sup> Clearly, the successful representation of one’s claims as conforming to right reason was a valuable achievement. And being able to achieve it was a mark of being ‘reasonable’.<sup>53</sup>

In *De corpore politico*, Hobbes draws a parallel with Roman *disciplina militaris*. ‘[M]artial law’, he had asserted, ‘is civil law, because an army is a body politic, the whole power whereof is in the General, and the laws thereof made by him; and though they still follow and change as reason requireth, yet it is not, as the reason of every private man, but as the reason of the General requireth’.<sup>54</sup> In *De cive* (1642), he clearly expressed the idea that civil authority is necessary to determine right reason, and that this authority is exercised in the application of *names*:

For men, by reasoning, do search out such kind of definitions in their observation of diverse conceptions, for the signification whereof those appellations were used at diverse times and for diverse causes. But the decision of the question, whether a man do reason rightly, belongs to the city. For example, if a woman bring forth a child of an unwonted shape, and the law forbid to kill a man; the question is, whether the child be a man. It is demanded therefore, what a man is. No man doubts but the city shall judge it, and that without taking an account of Aristotle’s definition, that man is a rational creature. And these things, namely, *right*, *policy*, and *natural sciences*, are subjects concerning which Christ denies that it belongs to his office to give any precepts, or teach any thing,

51 Boyle Robert, *How the Christian Religion Conforms to Reason*, in *The Works of Robert Boyle*, ed. M. Hunter – E.B. Davis, 14 vols. (London: 1999–2000), vol. XIV, 175–218, esp. 180–181.

52 Chauvin, *Lexicon philosophicum* 556 col.1.

53 For more on ‘right reason’, see Dear P., “Divine Illumination, Mechanical Calculators, and the Roots of Modern Reason”, *Science in Context* 23 (2010) 351–366, esp. 361–363.

54 Hobbes, *De corpore politico* 226.

beside this only; that in all controversies about them, every single subject should obey the laws and determinations of his city.<sup>55</sup>

Hobbes concludes: 'Yet must we remember this, that the same Christ, as God, could not only have taught, but also commanded what he would.'<sup>56</sup> In effect, Christ's teachings—'render unto Caesar'—were God's commands. Hobbes recognizes no place for expert witnesses in the polity. Only the civil power can determine 'whether a man do reason rightly', and Christ agreed.

Reason, in other words, needed to be policed correctly; its virtue, represented above all in the strict procedures of mathematics, could not stand by itself. Otherwise, exactly as in the case of religious enthusiasm, the social fabric would fall apart.

By the time that he composed *Leviathan*, Hobbes had decided, against his earlier position, that right reason needed to be retained as a metaphysical reality, just as he retained 'natural law' and 'natural reason'. These 'natural' (that is, God-given) categories provided the raw materials, the candidate determinations, that properly constituted authority would then validate or invalidate. Right reason, although not 'constituted by Nature', was still right, because it was authoritatively established, and if it derived from God-given natural reason—albeit via fallible individuals—its authority was more than merely arbitrary. Quentin Skinner has noted a similar shift in Hobbes's later writings: where he had once dismissed oratorical skill as superfluous in establishing conclusions in legal matters (as long as one's arguments were sound), Hobbes decided in *Leviathan* that 'if there be not powerfull Eloquence, which procureth attention and Consent, the effect of Reason will be little'.<sup>57</sup> Skinner characterizes this change as a return to the values of humanism, whereby reason and eloquence work together. In the case of reasoning itself, perhaps a similar sense of the importance of persuasion led Hobbes to entrench 'natural' reason as a foundation, although inaccessible, for the sovereign's 'right reason'.<sup>58</sup> Regardless, Hobbes's concern was always with the issue of how questions were in practice decided, and by whom. For others, the issue could be framed in different terms: not by whom, but by what.

55 Hobbes Thomas: *De Cive: Philosophical Rudiments Concerning Government and Society*, EW vol. II, 269.

56 Ibidem.

57 Hobbes, *Leviathan* 483; Skinner, *Reason and Rhetoric* chap. 9.

58 One might see here something structurally analogous to Kant's noumenal/phenomenal distinction.

## 4

Scholastic niceties of philosophical discussion about mental faculties and processes find a striking reaffirmation in the work of an experimental and mechanical philosopher of the second half of the seventeenth century, Robert Hooke. Hooke shows how these elaborate but apparently rather abstract concepts could be translated, in part at least, into a mechanical ontological idiom. Furthermore, Hooke's attempt to materialize ontological categories reflects the century's tendency to reify the formerly more analytical categories, especially that of prime matter, in the manner noted by Reif.

In his 1665 *Micrographia*, Hooke notes our involuntary

[...] wonder at the strange kind of acting in several Animals, which seem to savor so much of reason; it seeming to me most manifest, that those are but acting according to their structure[.] [Hooke here supplies an example involving the discharge of a gun.] [I]n all which actions, there is nothing of intention or ratiocination to be ascrib'd either to Animal or Engine, but all to the ingeniousness of the contriver.<sup>59</sup>

But some years later, in a Gresham College lecture that Hooke gave in 1682, Hooke went into great detail concerning what he called a 'mechanical and sensible Figure and Picture' of 'all the Actions and Operations of the Soul.'

Of these operations, Hooke specifies 'Apprehending, Remembling and Reasoning'.<sup>60</sup> These three are of course a variant on standard scholastic categories for explicating the soul, namely the intellect, memory, and reason; Hooke substitutes reason for the commonly adduced will. Hooke's chief concern in this lecture is with what he calls the 'Repository or Organ of Memory', including an explication of human awareness of time.<sup>61</sup> His approach involves

59 Hooke Robert, *Micrographia, or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses* (London, John Martyn – James Allefry: 1665) 190.

60 Hooke Robert, *The Posthumous Works of Robert Hooke*, ed. R. Waller (London, Sam Smith – Benjamin Walford: 1705). [hereinafter PW] 141. Cf. also Thomas Willis on the functions of the brain, as discussed in Kassler J.C., "Restraining the Passions: Hydropneumatics and Hierarchy in the Philosophy of Thomas Willis", in Gaukroger S. (ed.), *The Soft Underbelly of Reason: The Passions in the Seventeenth Century* (London: 1998) 147–164.

61 PW 145. See esp. Oldroyd D.R., "Some 'Philosophicall Scribbles' Attributed to Robert Hooke", *Notes and Records of the Royal Society* 35 (1980) 17–32; also Singer R.B., "Robert Hooke on Memory, Association and Time Perception", *Notes and Records of the Royal Society* 31 (1976) 115–131; Mulligan L., "Robert Hooke's 'Memoranda': Memory and Natural History", *Annals of Science* 49 (1992) 47–61, esp. 52–54.



a distinction between a soul stipulated to be incorporeal and physically located at a dimensionless point somewhere inside the brain, and the material brain itself; Hooke evidently makes use of the familiarity of Descartes' account.<sup>62</sup> Hooke stresses that the memory is a sensory organ just as much as the eye or the ear; these are all of them 'Corporeal Organs' that the soul employs, '[...] and without them cannot effect what it wills.'<sup>63</sup> The items stored in this (what he calls) 'repository' are *ideas*. These ideas are to some degree implanted by motions conveyed into the brain by the senses, 'but chiefly', he says, 'by the Soul it self':

This action of the Soul is that which is commonly called *Attention* [...]. My notion of it is this, that the Soul in the Action of Attention does really form some material Part of the Repository into such a Shape, and gives it some such a Motion as is from the Senses conveyed thither; which being so formed and qualified, is inserted into and inclosed in the common Repository, and there for a certain time preserved and retained, and so becomes an Organ, upon which the Soul working, finds the Ideas of past Actions, as if the Action were present.

This repository I conceive to be seated in the Brain, and the Substance thereof I conceive to be the Material out of which these Ideas are formed [...]. So that there is as it were a continued Chain of Ideas coyled up in the Repository of the Brain [...].<sup>64</sup>

These 'Ideas', which have been emitted over time outwards from a central point, 'I will suppose', Hooke says, 'to be material and bulky, that is, to be certain Bodies of determinate bigness, and impregnated with determinate Motions [...]' and as they have their distinct Figures, so have they each of them their distinct Qualifications of Motions and Constitutions'.<sup>65</sup> The central point from which these ideas originate is the soul, which Hooke had previously described

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62 In greatest detail in *L'Homme* (1664); AT vol. XI; see also Clarke D.M., *Descartes's Theory of Mind* (Oxford: 2003), on memory and imagination in Descartes. An indication of materialist reification in early seventeenth-century Aristotelianism, consistent with Reif's general observations, may be found in Blank A., "Material Souls and Imagination in Late Aristotelian Embryology", *Annals of Science* 67 (2010) 187–204.

63 PW 140.

64 Ibidem.

65 Ibidem 142.

as an 'Incorporeal Being';<sup>66</sup> but this incorporeal soul nonetheless gives forth a spherical radiation comparable to the light from the sun.<sup>67</sup> Thus,

[...] the Radiation of the Soul is more powerful upon Ideas at a nearer than at a further Distance; and their Reaction is also more powerful back again, and that in a duplicate proportion to their Distance reciprocal much the same with that of Light, which is the most spiritual Action of all we are sensible of in the World.<sup>68</sup>

Hooke describes a sort of resonance between this radiation and the repercussions of the material Ideas that it encounters, analogizing it to the 'Sympathetick Agreement' of musical strings.<sup>69</sup>

Hooke's picture of the radiating soul and its interaction with humming material Ideas in the brain provides his view of what he calls '[...] that Action of the Soul which is commonly called Reasoning'. This action '[...] is the forming new Ideas from the comparing the Re-actions from several Ideas placed here and there in the Repository, and its [i.e., the soul's] being sensible of the Harmony or Discord of them one with another'.<sup>70</sup> Evidently associating the formal character of this physical process with syllogistic logic, Hooke asserts that 'the Conclusion' is the new Idea formed by '[...] the comparison of other Ideas which may be contain'd in the *major* and *minor* Propositions'.<sup>71</sup>

In effect, Hooke represents the soul as picking out the conceptual materials that go to produce a deductive inference. In rhetorical terms, the soul carries out the stage of *inventio*, picking out the appropriate materials for building an argument, and then, 'its being sensible of the Harmony and Discord' of various Ideas, serves to produce something new, '[...] wherein all those various Respects are in some means united and impressed upon one and the same Idea'.<sup>72</sup> This co-ordination effectively represents what was called in rheto-

66 Ibidem 140.

67 The ambiguity in Hooke's 'mechanism' between the material and the spiritual is investigated by Henry J., "Robert Hooke, the Incongruous Mechanist", in Hunter M. – Schaffer S. (eds.), *Robert Hooke: New Studies* (Woodbridge, Suffolk: 1989) 149–180; see esp. 152–155 on light. See also Hatfield, "The Cognitive Faculties" 956, on scholastic-Aristotelian views regarding the intellect's 'illuminating' sensory input.

68 PW 145.

69 Ibidem; see Kassler J.C., *Inner Music: Hobbes, Hooke and North on Internal Character* (Madison: 1995) 134–137.

70 PW 146.

71 Ibidem.

72 Ibidem.

ric *dispositio*. Characteristically, Hooke's account leaves unclear exactly how much of this process is due to the free action of the incorporeal soul, and how much to the result of physically determinate interactions between a vibrating soul-point in the brain and the equally resonant 'material and bulky' Ideas distributed through the brain's 'repository'. But the chief function of the soul *qua* incorporeal seems to be its use of the will to select which of the resonating Ideas it will pay attention to, and which ones not.<sup>73</sup> The combination, or disposition, of these Ideas, by which new ones will be formed, results from the soul's awareness of the way in which these Ideas, seen as resonators, produce 'Harmony or Discord'. So the job of the incorporeal soul seems to be not just its intellectual power of judgement, or comparison, but also its exercise of will. Hooke's account precisely corresponds, therefore, to the conventional Aristotelian division of cognitive labour between the intellect and the will. Inferential reasoning, on this model, uses those two functions in concert with the memory, which stands for the preservation of corporeal Ideas in the brain's 'repository', to conduct the process of *inventio* whereby the will picks out appropriate Ideas for possible subsequent combination.<sup>74</sup>

So Hooke's quasi-mechanical model mirrors closely the usual scholastic, and Cartesian, account of the difference between 'reason' and 'intellect': the former is concerned with producing conclusions, while the latter concerns the principles, or premises, from which those conclusions are deduced. For Hooke, the incorporeal soul both selects the premises and deduces the consequent conclusions. But what is striking in this account is that the intellect makes these judgements of comparison by its becoming aware of *physical* 'Harmony or Discord' located in the brain itself and playing the role of 'Ideas'. In Hooke's terminology, all these processes together constitute *reasoning*, as the product of a corporeal engine supervised and guided by an immaterial soul. No single constituent part can be identified with 'reason', except perhaps in some phenomenological sense. The soul, that which steers the boat, still transcends the merely material.

73 On the larger theme of 'attention', see Daston L., "Attention and the Values of Nature in the Enlightenment", in Daston L. – Vidal F. (eds.), *The Moral Authority of Nature* (Chicago: 2004) 100–126.

74 Cf. Yeo R., "Between Memory and Paperbooks: Baconianism and Natural History in Seventeenth-Century England", *History of Science* 45 (2007) 1–46, esp. 27–28; on the specific theme of the corporealization of memory, Sutton J., "Controlling the Passions: Passion, Memory, and the Moral Physiology of Self in Seventeenth-Century Neurophilosophy", in Gaukroger (ed.) *The Soft Underbelly of Reason* 115–146. On *inventio* and *dispositio*, cf. Locke, section 11, above.

Nonetheless, Hooke transferred a great deal from the soul to matter; in some respects, the chief characteristic left to the soul was the will itself. Material bodies took over most of the other functions. They possessed the properties of shape and motion; that was what matter was good for in Hooke's version of mechanical philosophy. By invoking periodic vibration as a particular mode of motion, Hooke made these inert material bodies, with their similarity to the uninformed but reified prime matter of seventeenth-century Aristotelian pedagogy, into interactive resonators that could agree or disagree in their consonances or dissonances. Resonance itself as a phenomenon remained primitive: its familiarity still rested on empirical familiarity with musical strings and bells rather than on theoretical accounts of the mechanics of simple harmonic motion (although 'Hooke's law' should not be entirely forgotten in this connection). In his 1674 Cutlerian Lecture *De potentia restitutiva*, Hooke had played with an idea that links to suggestions made by Hobbes, and before him Francis Bacon, on the behaviour and nature of matter, specifically its propensity never to be truly at rest. The question for Hobbes and Hooke in particular was one that had been notably addressed by Descartes: why are material bodies mutually impenetrable? Why do bodies resist penetration by other bodies; what *kind* of force of resistance is this?<sup>75</sup> Hooke notices that rapid back-and-forth vibratory motion would itself tend to repel other bodies entering the vibrating body's range of amplitude: his most striking example, literally and figuratively, imagines a flat iron sheet one foot square that moves back and forth extremely rapidly perpendicular to its face, across an amplitude of a foot. '[T]his will compose such an essence as I call in my sense a Cubick foot of sensible Body [...]. The particles therefore that compose all bodies I do suppose to owe the greatest part of their sensible or Potential Extension to a Vibrative motion'.<sup>76</sup>

Hooke suggests that the particles of all bodies tend to exhibit some kind of vibrative motion (elaborated by reference to vibrating musical strings); their harmonious motions are communicated between bodies through a subtle fluid of some kind that surrounds and pervades them.<sup>77</sup> His general picture of solid bodies as being made of particles that rattle back and forth against one another is very similar to some of Hobbes's discussions in *De corpore* as well

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75 See the important discussion in Gabbey A., "The Mechanical Philosophy and Its Problems: Mechanical Explanations, Impenetrability, and Perpetual Motion", in Pitt J.C. (ed.), *Change and Progress in Modern Science* (Dordrecht: 1985) 9–84, esp. 28–38.

76 Hooke Robert, *Lectiones Cutlerianae* (London: 1679) 8. See also Kassler, *Inner Music* 128–129.

77 Ibid. 9.

as some of Bacon's natural philosophy,<sup>78</sup> while John Henry has characterized Hooke's use of the 'similitude' of musical harmony as an aspect of the 'spiritual' rather than the strictly 'mechanical' in Hooke's physical explanations.<sup>79</sup>

Hooke's Cutlerian lecture concerned springiness in general, related to his contentious spring-regulated watch. By tying it into his speculative matter-theory, concerning questions of penetrability and impenetrability, he could provide a theoretical context for computing the behaviour of springs, thereby vindicating his eponymous law and implying his intellectual priority regarding the watch.

The plausibility of Hooke's matter-theory, like the plausibility of his account of the soul, reason, and memory, depended on a variety of epistemic themes. Reasoning, understanding, even 'priority of invention' were all deployed as legitimate moves in the conduct of natural philosophy.<sup>80</sup> The theme of reason and the theme of material, efficient explanation acted so as to support one another.

## 5

Étienne Chauvin provided in his lexicon a compendious account of how the term *ratio* was used in logic; in that context, he raised it above a mere matter of technical usage. He concluded the discussion by saying: 'Indeed, reason properly illuminates propositions, just as light itself brightens and darkens in turn.' This is a metaphor of reason as illumination that appears as often in Descartes as in Thomas Aquinas and many others. Giving examples and definitions for some statement, said Chauvin, '[...] is not properly to illuminate [it], but is at least an occasion to provide that it be illuminated'.<sup>81</sup> Unlike many earlier

78 Hobbes, *Elements* 354–355; EW vol. I, 476–477. Relevant remarks appear in Brandt F., *Thomas Hobbes' Mechanical Conception of Nature* (Copenhagen: 1928) 31. Hooke's debt to Hobbes's ideas on light were discussed in Shapiro A.E., "Kinematic Optics: A Study of the Wave Theory of Light in the Seventeenth Century", *Archive for History of Exact Sciences*, 11 (1973) 134–266, on 202–206. Bacon speaks of the internal motions of bodies in many places: e.g. *Sylva sylvarum*, exp. 9, Bacon Francis, *The Works of Francis Bacon*, ed. R.L. Ellis, J. Spedding, and D.D. Heath, 14 vols. (London: 1861–1879) vol. 11, 342.

79 Henry, "Robert Hooke".

80 Cf. Iliffe R., " 'In the Warehouse': Privacy, Property and Priority in the Early Royal Society", *History of Science* 30 (1992) 29–68.

81 '[...] verum hoc non est proprie illustrare; sed duntaxat occasionem praeberere, ut illustretur'.—Chauvin, *Lexicon philosophicum* 556. See also Dear, "Divine Illumination".

commentators on this matter, Chauvin does not specifically associate the illumination with God.

Malebranche, by contrast, had, just a couple of decades earlier, not only associated *ratio* with divine illumination, but also made a direct link with *ratio*'s Greek equivalent, *logos*, in the specifically Christian theological sense of Christ as the Word in St. John's Gospel, the second person of the Trinity.<sup>82</sup> That was, one might say, a theological context for *ratio*, and by no means a common one, but it was built directly on the disciplinary meanings found in logic rather than in metaphysics.

The breadth and practical use of such epistemic themes in the seventeenth century permit a clear passage to the eighteenth century's conventional stand-in for authorizing the predilections of the *philosophes*: the notional 'reasonable man'.<sup>83</sup> That fictional character had sometimes to be invoked precisely because defining 'reason' as an operational concept was so difficult. In the 'Preliminary Discourse' to the *Encyclopédie*, D'Alembert wrote: 'The art of reasoning is a gift which Nature bestows of her own accord upon men of intelligence, and it can be said that the books which treat this subject [referring here to logic textbooks] are hardly useful except to those who can get along without them'.<sup>84</sup> This view of 'reasoning' saw it as a procedure only inadequately formalized by syllogistic logic, something akin to 'good manners' (being an *honnête homme*); some people just knew how to do it.

As Descartes had noticed long before, skill in the right use of reason often escaped the sieve of formal logic. Nonetheless, the terminology of the discursive disciplines of logic, dialectic, and rhetoric proved of value to Hooke when he attempted to materialize and mechanize the operations of the soul, in a way only slightly more literal-minded than his Cartesian precedents. The interaction of such apparently diverse epistemic themes means that the implications of those themes' uses cannot be told in advance: finitism rules here too. By the time that D'Alembert made his observations on reasoning in 1751, he followed the elaboration of themes that had formed elements of a scholarly philosophical discourse for centuries—and this despite his well-known severe critiques in the same essay of the scholastic culture that had nurtured them. It would

82 Jolley N., "Reason's Dim Candle: Locke's Critique of Enthusiasm", in Anstey P.R. (ed.), *The Philosophy of John Locke: New Perspectives* (London: 2003) 179–191, on 187.

83 Daston L.J., *Classical Probability in the Enlightenment* (Princeton: 1988).

84 'L'art de raisonner est un présent que la Nature fait d'elle—même aux bons esprits; & on peut dire que les livres qui en traitent ne sont guere utiles qu'à celui qui peut se passer d'eux.'—d'Alembert, "Discours préliminaire" ix; trans. following the excellent version in d'Alembert Jean Le Rond, *Preliminary Discourse to the Encyclopedia of Diderot*, trans. R.N. Schwab (Indianapolis: 1963) 30.

be quite proper to say that D'Alembert pursued, in the 'Preliminary Discourse,' a political programme aimed at undermining the pedagogical institutions of the Old Régime, and that he did so in part by using intellectual tools that those institutions knew very well. D'Alembert had no ulterior political aims in making his observations about reasoning; the aims were immediate and visible. Unpacking the intellectual and theological underpinnings of his tools as they took form in the seventeenth century merely emphasizes the inseparability of the diverse categories—political, theological, intellectual, physical—that constituted the epistemic themes, and their historical continuities, throughout the period. It also shows how 'reason'—whether rooted in God or, now, in the 'reasonable man'—served, and remained, an essential tool for the establishment of authority.

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## *Devices and Epistemic Values*





## Sixteenth-Century Hydraulic Engineers and the Emergence of Empiricism

*Matteo Valleriani*

### Summary

At the end of the sixteenth century, engineers and practical mathematicians were able to improve their social status by fulfilling the requirements that arose from the revolution in warfare. Moreover, during this period the production of texts for this category strikingly increased. This increase is usually associated with the fact that social improvement corresponded with the possibility of working at court or for the relevant political authorities of the time. What is normally disregarded in this process is the fact that this category was linked to the scientific discourse of the period, that is, the discourse of natural philosophy. During the sixteenth century, hydraulic engineers and experts on pneumatics, for example, had already achieved new conceptions of the constitution of matter which were radically anti-Aristotelian. The first steps of this process of theorization were characterized by a certain epistemological conflict. On the one hand, engineers were in the habit of codifying their theoretical approaches in form of commentaries on ancient scientific works, calling on their authority in the footsteps of the Aristotelian commentators. On the other hand, however, they systematically referred to well-defined and repeatable practical experiments in a way that is extraordinarily similar to modern scientific practice. The paper will present the fundamental steps taken by Italian hydraulic engineers at the end of the sixteenth century as well as the epistemological evolution of their work.

Based on the work and practices of the engineers of the sixteenth century, the present work aims to show the emergence of empiricism as a method of scientific practice. In particular, the paper places hydraulic engineers at the centre of attention, since their discipline and activities were in a certain sense more advanced in comparison to other practical activities of the same period. From the point of view of research concerned with the emergence of empiricism, what makes early modern practical pneumatics particularly interesting are the

aspects that relate to the codification of knowledge.<sup>1</sup> The practical knowledge of the Renaissance was usually passed on by traditional learning-by-doing methods, mostly within institutionalized apprenticeships.<sup>2</sup> Before this period, practical mathematicians, engineers, and architects took notes and prepared drawings of their work, of what they conceived as possible technical realizations or of what they had observed, for instance, during a field trip. As early as the fifteenth century, some engineers and architects began to publish texts in order to disseminate their knowledge and skills. Very rarely, however, did these texts contain more than just a description of the technical enterprises they had in mind or had already realized. Certainly, the compilation of such treatises in itself represented an unprecedented level of abstraction and inspired the authors to reflect on their own experience, by, for example, attempting drawings of particularly elaborated mechanical devices.<sup>3</sup> As is well known, the history of technological drawings clearly shows that early modern professionals were increasingly able to codify more and more aspects of their knowledge, skills, and experience, either in texts or by means of drawings. It is only during the sixteenth century, however, that processes of codification of practical knowledge gave rise to a process of emergence of theoretical knowledge. The authors of this knowledge were not natural philosophers though, but the engineers and architects themselves. This is particularly well demonstrated by the emergence of ballistics from practical knowledge related to artillery and the use of firearms in the context of the early modern revolution in the art of war,<sup>4</sup> which led to the increased relevance of military architects and

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- 1 For a more detailed account on ancient pneumatics, see Valleriani M., "Ancient Pneumatics Transformed during the Early Modern Period", *Nuncius* 29 (2014) 127–173.
  - 2 The way in which this practical knowledge was passed on could obviously be more or less elaborate or institutionalized. For the aim of the present work, however, this generalization is sufficient. For more details concerning the role of practical knowledge in the process of emergence of theoretical knowledge in reference to the case of Galileo's scientific work, see Valleriani M., *Galileo Engineer*, Boston Studies in the Philosophy of Science (Dordrecht: 2010). See also, Renn J. – Damerow P. – Rieger S., "Hunting the White Elephant", in Renn J. (ed.), *Galileo in Context: An Engineer-Scientist, Artist, and Courtier at the Origins of Classical Science* (Cambridge: 2001) 29–152. For an analysis of the concept of practical knowledge, see Bruce M., "Knowing How and Knowing That: Artisans, Bodies, and Natural Knowledge in the Scientific Revolution", *Studies in History and Philosophy of Science Part A* 36, 3 (2005) 577–585. See also Smith P.H., *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: 2004).
  - 3 The most advanced analysis of early modern machine drawings is undertaken in the papers published in Lefèvre W. (ed.), *Picturing Machines, 1400–1700* (Cambridge, MA: 2004).
  - 4 The literature on the emergence of ballistics during the fifteenth and sixteenth centuries is extensive. For an introduction, see Arend G., *Die Mechanik des Niccolò Tartaglia im Kontext der zeitgenössischen Erkenntnis- und Wissenschaftstheorie*, Algorismus (Munich: 1998). For a

pneumatic and hydraulic engineers in early modern society. This situation is mirrored by the fact that at first hydraulic engineers codified their practical experiences and later, toward the end of the century, began to express their own theoretical explanations of the phenomena they were able to reproduce in the framework of their art. The present work intends to demonstrate that the emergence of empiricism as a scientific practice established during the seventeenth century is based on these first attempts to form theoretical explanations by engineers at the end of the sixteenth century. It will focus on the case of the hydraulic engineer Giovan Battista Aleotti, who published an edition of Hero of Alexandria's *Pneumatics* in 1589.<sup>5</sup>

### The Ancient Scientific Debate on the Constitution of the Elements

Imagine an open glass bottle. Blow inside it and then immediately plug the opening. If you immerse the bottle in water and take out the plug, you can observe air coming out of the bottle. Explaining this seemingly simple phenomenon caused significant problems in ancient times and again toward the end of the sixteenth century.<sup>6</sup>

Within the framework of Aristotelian doctrine, pneumatic phenomena were treated together with those of meteorology.<sup>7</sup> Their physical explanations were fundamentally based on the principles of rarefaction and condensation. In order to explain the rain cycle, for example, starting from water present on the earth's surface, Aristotle affirmed that the heat of the sun initiates a process

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more detailed study, see Büttner J. et al., "The Challenging Images of Artillery—Practical Knowledge at the Roots of the Scientific Revolution", in Lefèvre W. – Renn J. – Schoepflin U. (eds.), *The Power of Images in Early Modern Science* (Basel: 2003). For the role of ballistics in the frame of the art of war, see Schmidtchen V., *Bombarden, Befestigungen, Büchsenmeister. Von den ersten Mauerbrechern des Spätmittelalters zur Belagerungsartillerie der Renaissance. Eine Studie zur Entwicklung der Militärtechnik* (Düsseldorf: 1977).

5 Hero of Alexandria – Aleotti Giovanni Battista, *Gli artiftitiosi et curiosi moti spiritali di Herrone* (Ferrara, Vittorio Baldini: 1589). A series of papers are devoted to the life and work of Giovan Battista Aleotti in Fiocca A. (ed.), *Giambattista Aleotti e gli ingegneri del Rinascimento* (Florence: 1998). See also Scherf G., *Giovanni Battista Aleotti (1546–1636). "Architetto matematico" der Este und der Päpste in Ferrara* (Marburg: 1998).

6 The theme of the theoretical transformation of the science of pneumatics treated in this section is discussed more extensively in Valleriani M., "From Condensation to Compression: How Renaissance Italian Engineers Approached Hero's Pneumatics", in Böhme H. – Rapp C. – Rösler W. (eds.), *Übersetzung und Transformation* (Berlin: 2007) 333–354.

7 Aristotle, *Meteorologica*, in idem, *Aristotle in Twenty-Three Volumes*, trans. H.D.P. Lee, 23 vols. (Cambridge, MA: 1952) vol. VII.

of rarefaction: water heats up, is changed to air (vapour), its volume increases in extension and it becomes lighter. Finally, in agreement with the physical laws of the Aristotelian sublunary *plenum*, the air so obtained moves toward its natural site, thus moving upward. Upon reaching the upper regions, where the temperature is lower, the process of condensation begins: the air cools down and is transformed back into water, reducing the volume of its extension and thus growing heavier. Finally, due to this new transformation, the water falls back down onto the earth's surface in form of rain.

The simple phenomenon of the bottle experiment described above can be explained in Aristotelian terms by referring to the principles of condensation and rarefaction, and in particular, to the capacity of the elements to increase and reduce their volume. However, within the Aristotelian framework these characteristics of the elements are only found during a process of transformation from one element to another. Instead, in the case of the bottle the air is first condensed and then rarefied without being transformed into water.

After having noticed this problem within the Aristotelian doctrine, Hero of Alexandria, probably in the first century A.D., postulated the existence of micro-vacuums inside the elements.<sup>8</sup> According to this theory, these vacuums have the characteristic of being able to grow smaller or larger as a result of violent action; afterward they return to their original dimension, their natural state. Thus, blowing into the bottle compresses the extension of the vacuums inside the elements, and thereby the total extension of the volume of the quantity of the element initially enclosed in the bottle. Finally, due to the vacuums' tendency to return to their natural state, by immersing the bottle in water and removing the plug we can note the release of a determinate quantity of air. Hero provided these explanations in the preamble to his *Pneumatics*.

Once the text was translated into Latin and printed by Federico Commandino in 1575,<sup>9</sup> this theoretical problem awakened renewed interest, especially among Italian engineers, whose Aristotelian theoretical approach would not allow them to admit the existence of any form of vacuum, as this was incompatible with Aristotle's vision of the physical world as *plenum*. Yet based on their own experience they soon realized that it was impossible to uphold the Aristotelian principles.

8 In this article, the following edition of Hero of Alexandria's *Pneumatics* is used: Schmidt W., *Heronis Alexandrini Opera quae supersunt omnia*, 2 vols. (Leipzig: 1899). Hero describes his theoretical approach in the preamble to the text. See esp. 4ff.

9 Hero of Alexandria—Commandino Federico, *Heronis Alexandrini spiritalium liber* (Urbino, s.n.: 1575).

### The Boom in Renaissance Pneumatics

At the end of the sixteenth century, pneumatics was a flourishing practical activity cultivated by many engineers, especially at the courts. Practical activities in general were experiencing a dramatic increase in significance. In relation to architectural enterprises and within the vast frame of the early modern revolution of the art of war, technology, influenced in particular by economic forces, had its golden age during the Renaissance. It was not applied technology but the result of a series of technological innovations that radically changed social, political, economic, and military structures. They pervaded everyday life and finally gave impulse to the emergence of the new theoretical sciences.

The remarkable technological advancements achieved during the early modern period in the West is a well-known topic. It suffices to mention the 1957 third volume of the seminal encyclopedic work *A History of Technology*.<sup>10</sup> The seven volumes of this work were published between 1956 and 1984 to show that the process of acquisition of ancient knowledge relating to mixed sciences took place within the framework of the practical aspects of those mixed sciences which had been cultivated, elaborated and developed over an extensive period of time.

In the epilogue of that work, A.R. Hall distinguishes between two sorts of developments in early modern technology.<sup>11</sup> On the one hand, there was the technology market that addressed wealthy consumers and had existed for centuries. The production that took place in the context of this market was either at the boundaries of artistic production or completely merged with it. Technological development in this context probably reached its apex around the end of the sixteenth century and has never really diminished since. The other kind of technological development is characterized by two simultaneous processes. The first concerns the impoverishment of the quality of a product. This process was instrumental to the second, which concerned an increase in quantity as an output of production. It is this second kind of technological development that was assimilated into scientific developments during the late Renaissance, achieving so-called mass production very rapidly and, as a result, giving rise to the Industrial Revolution.

Remarkably, however, most of the works on the early modern history of technology do not dedicate any particular attention concerning practical

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10 Singer C.J. et al. (eds.), *A History of Technology*, 7 vols. (Oxford: 1956–1984).

11 Hall A.R., “The Rise of the West”, in Singer C.J. et al. (eds.), *A History of Technology* (Oxford: 1957) 709–721.

pneumatics. Such studies exist for ancient practical pneumatics, but historians of technology do not seem to have investigated Renaissance pneumatics as an independent practical activity. Sometimes it is more or less surreptitiously subsumed into more general discussions on hydraulics, sometimes it is associated with machine-building activities. Moreover, pneumatic machines are often mentioned as elements of curiosity cabinets, by-products of technicians fabricated in their spare time. In other words, early modern pneumatic machines are sometimes presented as mere outputs of recreational and convivial hobbies. The above-mentioned work *A History of Technology*, for example, does not address pneumatic machines at all.

Pneumatics in the Renaissance, however, represented a fundamental discipline, which, in combination with hydraulics, enabled engineers to create water supply systems and fluvial networks in order to supply entire cities and to power a great number of mills. An impressive example of the relevance of pneumatics during the Renaissance is represented by the project to lengthen the Secchia canal in the region of the Italian city Reggio Emilia during the first half of the fifteenth century. As Massimo Mussini recently showed,<sup>12</sup> the canal was lengthened by twenty kilometres, and in the process had to cross thirteen torrents. To cross the Tresinaro torrent, a 309,5-metre inverted syphon was built on the riverbed during the dry period.

Not only was this kind of engineering feasible due to the experience of hydraulic engineers, but it could only be realized if the background of such professionals included practical pneumatics as well.

Practical pneumatics had been cultivated without interruption and with more or less the same intensity since antiquity. Starting from the time of the Comuni in Italy and with favourable economic conditions, large-scale projects involving pneumatics gave rise to an impressive accumulation of experience and skill in this field. It is within this context that ancient pneumatics, in the form of editions of Hero's work, reappeared at the end of the sixteenth century.

### The First Italian Edition of Hero's Pneumatics

In 1582, Bernardo Buontalenti, chief engineer of the Grand Duchy of Tuscany, requested that Oreste Vannoccio Biringuccio translate the *Pneumatics* into

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<sup>12</sup> Mussini M., "Governo delle acque nel territorio reggiano fra Medioevo e Rinascimento", in Calzona A. – Lamberini D. (eds.), *La civiltà delle acque dal Medioevo al Rinascimento* (Florence: 2010) 221–241.



Italian.<sup>13</sup> This first Italian translation revealed awkward theoretical problems, to such an extent that Oreste Vannoccio Biringuccio added a personal comment to Hero's preamble. Confronted with Hero's proposal that the elements and especially air be conceived as constituted of micro-vacuums, Vannoccio Biringuccio explained that<sup>14</sup>

rarefaction and condensation are enough [...] to explain all the experiments adduced by Hero [...] of cupping-glasses, the sucked vase, and the inflated sphere and whichever other similar vases that can be adduced and that, either naturally or artificially, become attractive and expulsive, although such effects happen because of rarefaction or *excessive condensation*, which is also hated by nature, and tolerated only because of a temporarily short violence.

Vannoccio Biringuccio postulated the existence of a process of condensation different from the Aristotelian. First, this was conceived as violent motion and the fundamental characteristic of this process was that it did not require the condensed element to change in form and be transformed into another element. The fact that this process is violent implies that it can be caused and set in motion deliberately by technicians and not by nature.

The brief passage that introduces this new principle marked the start of a far more profound process of transformation. This reached its first apex seven years later when an edition of Hero's *Pneumatics* with commentary, edited by the famous engineer of the Este family Giovan Battista Aleotti, was published in Ferrara.<sup>15</sup> Before analyzing the next theoretical step, however, it is necessary

13 Hero of Alexandria—Vannocci Biringucci Oreste, "Libro degli artifizii spiritali over di fiato d'Herone Alessandrino", in *Ms. L. VI. 44* (Siena, Biblioteca degli Intronati: 1582; reprint, electronic edition by the Max Planck Institute for the History of Science. URL = <<http://echo.mpiwg-berlin.mpg.de/content/pratolino/sources>>). Daniela Lamberini reports the existence of this Italian translation of Hero of Alexandria's *Pneumatics* in Lamberini D., "Boboli e l'ingegneria idraulica alla scuola dei Parigi", in *Boboli 90* (Florence: 1990) 467–479, here 474.

14 '[...] basta la rarefattione el condensamento [...] a salvar tutte le esperienze addotte da Herone e dagli altri delle ventose, del vaso succhiato, e della sfera gonfia e quant'altre simili se ne potessen addurre di vasi che per natura, o per arte diventino attrattivi o espulsivi, pero che tali effetti avvengano per la rarefattione o, *condensamento soverchio* che è anch'esso odiato dalla natura e sopportato solo per violenza breve tempo [...]'(author's italics.)—Hero of Alexandria—Vannocci Biringucci, "Libro degli artifizii spiritali over di fiato d'Herone Alessandrino" fol. 3v.

15 Hero of Alexandria—Aleotti, *Gli artiftitiosi et curiosi moti spiritali di Herrone*.

to understand the kind of practical experience that enabled practice-oriented scholars and professionals to enter into debates on the constitution of matter and the existence of void, or about phenomena that could be explained on the basis of a specific conception of matter. To achieve this goal, we must first enter the Renaissance Garden of Pratolino.

### The Garden of Pratolino

The Garden of Pratolino was conceived by the Grand Duke of Tuscany Francesco I, together with his chief engineer and close friend Bernardo Buontalenti. The piece of land for the park was purchased in 1568 and the construction of its first building—the Grand Duke's villa—began in 1570. Construction in the park continued until the end of the century, well after the death of Francesco I, but continued to be supervised by Buontalenti. The garden is located about twelve kilometres outside of Florence, and included a large number of water curiosities, fountains, and groups of water-powered automata. Water was the dominant element. Water could symbolize the difficulties, hazards and uncertainties encountered en route to the elevation of the human intellect. In order to take on this important role in the garden's dynamics, first the water had to be tamed and controlled. It is here that the use of pneumatic technology found its *raison d'être* and point of pride: technical experts, engineers, and constructors worked together in the service of a cultural project aimed at nothing less than strengthening human rationality in harmony with nature.<sup>16</sup>

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16 The literature on the garden of Pratolino is impressive. For a general study, see the fundamental publication by Zangheri L., *Pratolino, il giardino delle meraviglie*, Documenti inediti di cultura Toscana, 2 vols. (Florence: 1987). Recently, a series of papers devoted to all possible aspects that make the Garden of Pratolino interesting not only for historians of technology and science, but also for art historians, have been published in Olivieri L. – Merendoni S. (eds.), *Pratolino, un mito alle porte di Firenze—Pratolino, a Myth at the Gates of Florence* (Venice: 2009). See also, for more detail, Valleriani M., “The Transformation and Reconstruction of Hero of Alexandria's «Pneumatics» in the Garden of Pratolino”, in Olivieri L. – Merendoni S. (eds.), *Pratolino, un mito alle porte di Firenze—Pratolino, a Myth at the Gates of Florence* (Venice: 2009) 155–181. See also Valleriani, “The Garden of Pratolino: Ancient Technology Breaks Through the Barriers of Modern Iconology”, in Adamowsky N. – Felfe R. – Böhme H. (eds.), *Ludi Naturae—Spiele der Natur. Transformationen eines antiken Topos in Wissenschaft und Kunst* (Munich: 2010) 120–141, and Valleriani, “Il ruolo della pneumatica antica durante il Rinascimento: l'esempio dell'organo

Pratolino comprised two levels: the exterior surface of the garden, visible to all visitors, and the concealed underground section. Beneath the garden was an enormous hydraulic laboratory with numerous grottos, keys, vats, valves, pipes, and passageways. This was certainly planned from the beginning and built from 1568 onward, just before the construction of the villa began in 1570. The hydraulic and pneumatic technology at Pratolino represents the highest standards reached in these activities during the sixteenth century. According to engineers' reports, Pratolino had up to 172 keys which activated and deactivated the numerous devices. These were located along kilometres of a subterranean aqueduct, which, surprisingly for the time, was not built on the basis of simple geometrical shapes and limited by economic constraints, but rather followed paths without any apparent order.<sup>17</sup>

In 1600, the German engineer Heinrich Schickhardt visited Pratolino.<sup>18</sup> By reconstructing part of his trip, it is possible to offer an idea of the technology employed at Pratolino.<sup>19</sup> Under the villa of the Grand Duke were two levels of grottos, where different mechanical devices could be admired. On one level was a grotto with two-sided automata systems. One of these systems represented the God Pan [Fig. 2.1]. In Stefano della Bella's engraving, we can clearly see Pan and the nymph Syrinx. These are neither paintings nor statues, but rather very large automated machines. The best description of what a visitor could see, in line with the plans of Francesco I, is by Da Prato, who wrote a celebratory text for the Demidoff family, later owners of the garden, published in 1886:<sup>20</sup>

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idraulico nel giardino di Pratolino", in Calzona A. – Lamberini D. (eds.), *La civiltà delle acque dal Medioevo al Rinascimento* (Florence: 2010) 613–632.

- 17 A map of the Pratolino aqueduct can be seen in Lorraine Archive, Pietro Leopoldo 57. See also Zangheri, *Pratolino, il giardino delle meraviglie*, vol. 1, 253.
- 18 Schickhardt Heinrich, "Zweite italienische Reise", in *Cod. Hist. 4, ms. nr. 148* (Stuttgart, Württembergische Landesbibliothek: 1600).
- 19 A virtual tour through the Garden of Pratolino with access to sixteenth-century historical sources is provided at URL = <<http://pratolino.mpiwg-berlin.mpg.de>> (March 2013).
- 20 'Questa seconda grotta è la fontana del Dio Pane. Questo Nume si raffigura per mezzo d'una statua seduta sopra diverse canne; si vede rizzare, si vede muovere la testa e rigirare gli occhi; ha fra le mani una zampogna, con sette buchi che suona da maestro, producendo gran diletto in chi l'ascolta, e facendo ballare gente al disopra; dopo aver suonato a suo talento, tornasene a sedere, e mettesi a guardare una donna che gli sta dappresso. È costei la ninfa Siringa, la quale, come sdegnando d'essere troppo guardata da quel magico suonatore di zampogna, si converte in una canna, e spilla un chiaro gorgo d'acqua. A tanta metamorfosi sorge un cuculio sulle frondi che fan parte dell'ornato, e s'abbandona ad un canto quanto mai gentile. Nell'udire il gentil canto del cuculio vien



FIGURE 2.1 Stefano della Bella's sixteenth-century engraving of the Grotto of Pan in the Garden of Pratolino. From Sgrilli, Bernardo Sansone, *descrizione della Regia villa, fontane e fabbriche di Pratolino* (Florence, Tartini e Franchi, stamperia granducale: 1742). COURTESY OF THE BIBLIOTECA RICCARDIANA IN FLORENCE.

This second grotto is the fountain of Pan. The divinity is portrayed by a statue seated on reeds; it stands up, moves its head and turns its eyes; in its hands it holds a zampogna [bagpipe] with seven holes and plays it like a master, to the great amusement of the listeners, causing the people above to dance; after displaying its talent it sits down and gazes at a woman near to him. She is the nymph Syrinx who, annoyed at being stared at by the magical musician, transforms herself into a tuft of reeds

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fatto di voler guardar dov'ei si trova, onde gli occhi nostri han luogo d'incontrarsi nelle altre bellezze della grotta dalla volta fatta in forma di mezza botte [...]. Si tratta di bellezze molto somiglianti a quelle già viste in altre grotte, come bassirilievi, e mosaici: essi mosaici sono peraltro composti di scagliette di marmi a colori svariati, con cui si rappresentano molti grotteschi squisitamente fatti; e le fronde e le foglie dove il cuculio prosegue a cantare si mescolano in sì mirabile guisa colle differenti spugne, che per quanto di congenere abbiamo visto, sembra di vedere ancora un bello affatto nuovo'. – Prato C. da, *Firenze ai Demidoff. Pratolino e S. Donato. Relazione storica e descrittiva preceduta da canni biografici sui Demidoff* (Florence: 1886) 260–261.

and spouts a stream of clear water. Amidst all these changes, a cuckoo rises from the fronds that are part of the decoration and starts to sing a sweet song. Listening to the cuckoo's song one wants to see where it is, and our eyes can see the other beauties of the grotto, from the half-barrel vaults [...]. These beautiful things are very similar to what we have seen in other grottoes such as bas-reliefs and mosaics: these mosaics are made of different coloured pieces of marble and depict exquisitely crafted grotesques; the leaves and branches where the cuckoo continues its song blend beautifully with the sponges and, for all the wonderful things we have seen it seems that we see a completely new beauty.

Heinrich Schickhardt was not overly impressed by these effects. Certainly his curiosity was aroused by the cuckoo, since he was not able to identify the source. The cuckoo was a scenic artifice which forced visitors to turn their eyes elsewhere and perhaps encounter the gaze of others. However, Schickhardt decided to continue and go around to the back to discover the secret of the cuckoo.

The engine room of the Grotto of Pan still exists today [Fig. 2.2]. This photograph, taken by Jochen Büttner in October 2007, shows the room behind the automata of Pan and the nymph Syrinx. To get an idea of what was operating in this engine room, we can read an excerpt from a report most probably written by Giuseppe Ruggieri in 1757, which is conserved in the State Archives of Prague:<sup>21</sup>

Behind the statue of Mugnone inside the Grotto of Pan is a small cistern that takes the overflow from a larger one and leads it to a small vat marked 66, where the pipe divides into two branches that bring the water to the cisterns of the Fountain-Alley [...]. In the chambers beneath the Grotto of Pan are six keys; one is used to fill the drum to activate the statue of

21 'Dietro alla statua del Mugnone nella Grotta del Dio Pan vi è una pila, che prende l'avanzo del Pilone segnato 66, dove si divide il condotto in due rami, che portan l'Acqua alle Pile dello Stradone [...]. Nelle Stanze Sotto la Grotta del Dio Pane, vi sono sei chiavi, che una serve per empire il tamburo per fare operare la Statua del Satiro, una per dare il vento al Suono, che tiene in mano, una per vuotare il tamburo di detta Statua, una per dare Acqua alla Statua della Siringa, una per dare il vento al Tamburo, che fa cantare il Cuculio, e una per votare il Tamburo di detto Cuculio'. – Transcription from Zangheri, *Pratolino, il giardino delle meraviglie*, vol. 1, 246 and 50.—Lorraine Archive, Pietro Leopoldo, *Piante dei condotti*, fol. 20r and fol. 25r–v.





FIGURE 2.2 *Engineering room behind the Grotto of Pan in the Garden of Pratolino. Photo by Jochen Büttner, October 2007.*

COURTESY OF THE MAX PLANCK INSTITUTE FOR THE HISTORY OF SCIENCE, BERLIN.

the satyr [Pan stands up], one to produce the wind for the instrument he holds in his hands [the seven-reed pipe], one to empty the drum [Pan sits down], one to send water to the statue of Syrinx [the nymph Syrinx is transformed into a tuft of reeds that spout water], one to fill the drum that makes the cuckoo sing and one to empty the cuckoo's drum.

This engine room could only be reached via secret passageways behind the Grotto of Pan [Fig. 2.3]. The hydraulic system and pneumatic devices were not in constant operation in the Garden of Pratolino. There were a great number of keys, bearings, and valves along the underground passageways and a team of plumbers on hand to activate them. When a visitor walked around Pratolino, the plumbers moved with him, but remained unseen. According to Francesco I's concept, the tour of the garden had to be meticulously planned in advance. The photograph from October 2007 shows the plumbers' underground passageway, which connects the Grotto of Pan to the Grotto of the PHEME. Because of the acoustics, the automata in the two grottoes could not be activated at the same time as the first played a Pan pipe and the second a trumpet. Schickhardt probably went through this passageway on his way to the engine room of the Grotto of Pan.



FIGURE 2.3 *Hidden passage between the Grotto of Pan and the Grotto of Pheme in the Garden of Pratolino. Photo by Jochen Büttner, October 2007.*

COURTESY OF THE MAX PLANCK INSTITUTE FOR THE HISTORY OF SCIENCE, BERLIN.

In his notes, Schickhardt sketched a machine which created the cuckoo's song [Fig. 2.4]. He located it inside the Grotto of the Samaritan, where several machines were set up, which reproduced the songs of several birds. Other sources, however, raise doubts as to whether there was a machine to reproduce the cuckoo's sound in the Grotto of the Samaritan. However, since the machines were similar, one can assume that the machine inside the engine room of the Grotto of Pan making the sound of the cuckoo was identical to the one sketched by Schickhardt who described it as follows: 'At the top there is a container A filled with water. It has a feed cock B so that neither too much nor too little water goes onto the wheel and into container C (that sends the air into the pipes)'.<sup>22</sup> The two keys relative to the cuckoo, as described in the documents of the Lorraine Archive in Prague, served to fill container A

22 'X—steht ein Guckhgauck. Der Guckhegauch: Oben steht ein irdener Scherb A vol Wasser. Hat ein Theihanen B, darmit nicht zuvil oder winig Wasser uf das Rad und in Casten C (daraus der Luft in die Pfeifen geht) kom'—Schickhardt, "Zweite italienische Reise" b—fol. 52r.

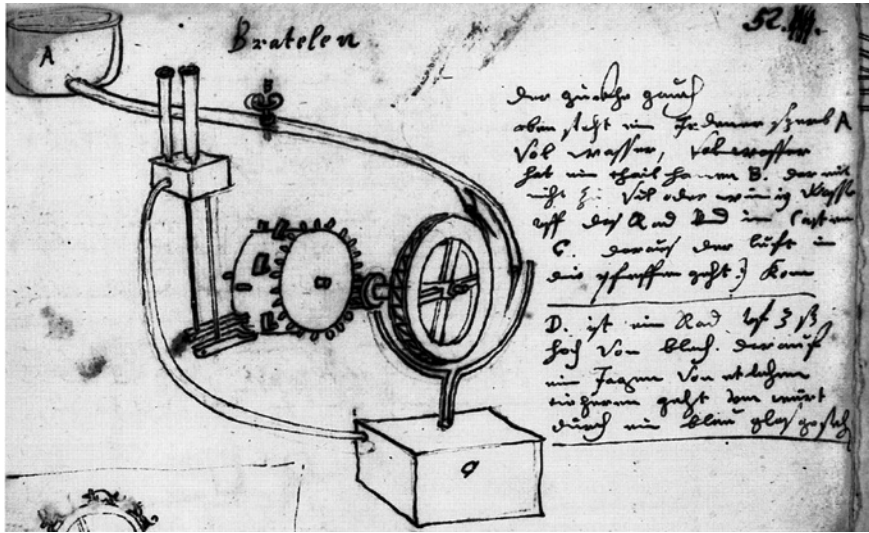


FIGURE 2.4 Heinrich Schickhardt's drawing of a cockoo machine built in the Garden of Pratolino. Cod. Hist. 4. 148, Württembergische Landesbibliothek, Stuttgart, 1600, fol. 52r.

and to drain container C at the end of each performance.<sup>23</sup> Feed cock B was not a key, but most probably a valve which served to regulate the flow and not to stop it. Without a theory of water flow and the possibility of applying it to a specific mechanism, the Renaissance engineer's method was first to build the device and then to adjust it. The constructors built the machine in a way that it could use just one valve, which implies that experiment provided the minimum and maximum conditions for the machine's operation. The other components of the machine were: 1) a waterwheel which was evidently made in the manner of the old water mills insofar as the shape and angle of the paddles and their delivery were concerned, 2) an overshot pouring the water onto the paddles, 3) a camshaft which, through a transmission mechanism, opened and closed the probably piston-shaped valves situated beneath the two organ pipes and inside a small sealed container for the air, 4) two gears for transmitting drive from the waterwheel to the camshaft. The first gear had a horizontal axle positioned at the centre and terminating in a gear that was known as the widely used spindle. The second one was positioned and built directly on top

23 The following analysis is also based on the results of research by Marcus Popplow and Wolfgang Lefèvre, who conducted a study on hundreds of Renaissance machines, including some of Schickhardt's. These results can be accessed via the Web portal 'Database Machine Drawings' at URL = <<http://dmd.mpiwg-berlin.mpg.de>> (March 2013).



of the camshaft. This gear offered another possibility to adjust the speed of the machine and hence the cuckoo's melody and its duration.

The water coming from container A was diverted into two pipes. The first threw water on the waterwheel paddles and the second led the water into container C, which was connected directly to the organ pipes supplying the air pushed out of container C by filling it with water. This machine must have reached a certain level of standardization, at least at Pratolino, since there was no provision for a valve to regulate the water flow after the pipe branched. In fact, this would have made it possible to adjust the machine for the melody to be played slower and louder, or faster and softer. As for the materials, the organ pipes were most likely made of lead, as was customary at the time.<sup>24</sup> The entire drive mechanism was made of wood, like the camshaft. Containers A and C were probably made of copper, since other containers and large parts of other machines were also made of copper, as described by Schickhardt.<sup>25</sup> Valve B was certainly made of metal, but it is difficult to determine whether it was iron or bronze. The pipes could have been made of lead or copper since no other material would have been able to function appropriately for this purpose. They were most probably made of copper. Even at low temperatures and using simple techniques it was already possible to weld the copper pipes to the containers. One technique was to cut a smaller opening than the diameter of the pipe into the container; the copper around the opening was heated, the pipe was inserted under pressure and held fast in the desired position until it cooled down.

On the basis of this example, it is possible to get an impression of the state of the development of practical pneumatics at the end of the sixteenth century. The numerous enterprises such as the gardens and hydraulic achievements all over the Italian peninsula, undertaken during the career of Giovan Battista Aleotti, clearly show that Aleotti had shared this kind of knowledge. Moreover, as I have shown elsewhere, the Garden of Pratolino can be considered as an attempt to realize a Heronian garden, since Buontalenti requested Vannoccio Biringuccio to translate Hero's *Pneumatics* while he was supervising

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24 The study on materials and how they are processed is based on the results published in 2006 following a reconstruction of the "Galatea" water organ built by De Caus in 1615. For more details, see the contributions by Hans Holländer, Yves Weinand and Guido Schumacher in Schmuhl B.E. – Omonsky U. (eds.), *Maschinen und Mechanismen in der Musik. Sammelband zur XXXI. Wissenschaftliche Arbeitstagung Michaelstein* (Augsburg: 2006).

25 The use of copper is confirmed by Schickhardt, for example in Schickhardt, "Zweite italienische Reise" b–fol. 50r.

the construction of the pneumatic devices in the garden during the 1680s.<sup>26</sup> Pratolino immediately became remarkably famous all over Europe, as is evidenced in the innumerable travel logs of the European visitors who undertook a trip to Italy at that time.<sup>27</sup> It may even be asserted that the successful material translation of Hero's *Pneumatics* in the Garden of Pratolino is what made Hero an authority among the engineers at the time. Ultimately, this may be the reason why not only Vannoccio Biringuccio but also Aleotti undertook the mission to translate, comment on, and publish Hero's *Pneumatics* in Italian at the end of the sixteenth century.

### Aleotti's Practice and the Theory of Void

Only seven years after the first Italian edition of Hero's *Pneumatics* was published in 1582, a new edition, enlarged and with commentary, went to press. The author and engineer, Giovan Battista Aleotti from Ferrara, also added a commentary to Hero's theoretical preamble.<sup>28</sup> He postulated both the possibility of creating a large-sized vacuum, not inside the elements but outside the bodies, and the possibility that elements can be compressed, thereby coming extraordinarily close to the modern concept of fluid mechanics which originated in the research of Robert Boyle.<sup>29</sup> Since the text is relatively short, it is worth reading it in its entirety, rendered for the first time in English as follows:<sup>30</sup>

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- 26 Valleriani, "Il ruolo della pneumatica antica durante il Rinascimento: l'esempio dell'organo idraulico nel giardino di Pratolino".
- 27 A famous example is Montaigne Michel de, *The Diary of Montaigne's Journey to Italy. 1580 and 1581* (London: 1929).
- 28 Hero of Alexandria.—Aleotti, *Gli artifiziosi et curiosi moti spiritali di Herrone*.
- 29 For an introduction to Aleotti's research on void, see also Keller A.G., "Pneumatics, Automata and the Vacuum in the Work of Giambattista Aleotti", *British Journal for the History of Science* 3, 12 (1967) 338–347.
- 30 'In conformità di quanto ha di sopra detto Herone, ci si può giungere che se pigliata una bachetta d'Arcobugio in capo la quale sia il suo rascatore ben fatto, la caccieremo in una canna d'Arcobugio giustissimamente forata per dritta linea con soma eccellenza indi chiuso di essa il fogone, se la tireremo quasi fuori, il che ci verrà fatto, con qualche difficoltà contrastandoci il vacuo, che resterà nella parte da basso per non succedervi l'aria) se tiratela dico, quasi fuori la rilasceremo, quel vacuo, perche non può essere se non per natura violentata tirerà (per subito riempirsi) in dietro con violenza detta bachetta; sì come anco per prova, che non può l'Elemento dell'Aria stare se non nella qualità della sua natura, e come lo creò Dio Onnipotente, se chiuso essendo il fogone d'essa canna

In accord with what Hero said above, one could add that if one takes a stick [a ramrod (*calcatoio*)] at whose end there is a well-made rabble

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vi caccieremo dentro la sopradetta bacchetta, che sentiremo (perche l'Aria è corpo) che lo faremo con fatica, & ch'ess'Aria verrà ad ammassarsi; e se cacciatala in giù quanto potremo la rilasceremo liberamente l'aria violentato, non potendo star constipato, e rumperà, e con furore scaccierà la bacchetta per ritornar subito (cessata la violenza) in sua natura: onde ci si fa chiaro, che cacciandovi una palla, stando chiuso il foggone, l'aria constipato per ritornare in sua natura la scaccia in violenza. E se quella ci dimostrerà non poter essere vacuo, questa ci farà chiari non poter questo Elemento stare se non nel termine della sua natura, come lo creò il suo Creatore.

Si prova inoltre non poter esser vacuo alcuno per quei vasi di vetro che sogliono servirsi le donne per iscemarsi, & in parte evacuari le mammelle del latte, che dopo ch'han partorito frà il termine di due, ò tre giorni gli suole in tanta abbondanza sopraggiungere, che non evacuandole ancora a i ban[m]bini nati, cagionarebbono in se stesse (non iscemandosi le mammelle) durezza, e mali gravissimi, questi hanno com'è noto un corpo nel quale è un buco tanto gra[n]de, che appoggiando il vaso alla Manc[mm]ella vi entra comodamente dentro il capitello di essa, & in altra parte hanno un collo tanto lungo, che lo pigliano in bocca, indi succhiatone l'Aria, ch'è nel vaso succede subito in luogo di esso latte, ch'escie fuori della mammella: E per quelle ampolle, che esse adoprare anco sogliono per detto effetto. Queste pigliano una ampolla di vetro con il collo tanto nella parte superiore largo, che sia capace del capitello della mammella, e riscaldano con il fuoco di essa il corpo ben bene, fin che il caldo penetrando per li vacui la sottigliezza del vetro ne scaccia l'Aria riempiendo il corpo della ampolla di sottilissimo vapore, e quando è ben bene riscaldato detto corpo subito si pongono la bocca del collo dell'ampolla alla mamella dentro imponendovi il capitello, e perche quel sottil vapore igneo non può star ivi rinchiuso se n'escie fuori per quei del vetro per li quali entrò, & per levarsi in alto al suo luogo s'invia: se ben dal circomposto aria è trasmutato in sostanza aerea, e perche per questi meati, che sottilissimi sono non vi può entrar l'aria non potendo esser vacuo subito quel corpo, che non può star voto tira da essa mammella il latte, & votando la viene a riempire se stesso, e ripeno a fatto, non più tira, come anco se aperto in qualche parte si lascia in esso entrar l'Aria.

I fuochi similmente, che sù le bocche delle fornaci (nelle quali si cuocono le pietre, e la calcina, e i vasi di terra) si accendono sono tirati dentro da esse fornaci dal vacuo; Imperoche il vapor del fuoco scacciatone l'Aria, che v'è dentro svanisce, & evapora in alto, & essendo sù la bocca della fornace il fuoco impedisce, che non vi può entrar l'Aria; ma perche non può esser vacuo svanendo il vapore, convien che il fuoco riempia il corpo voto, che verrebbe a restar nella fornace, perche uscendone il vapore è chiuso l'adito dell'Aria, nè potendo esser vacuo convien, che vi succeda il fuoco: delle qual cose consta con quanta eccellenza habbia provato Herone, il non concedersi vacuo del tutto se non violentato, e fuori di natura'. (author's italics)—Hero of Alexandria.—Aleotti, *Gli artificiosi et curiosi moti spiritali di Herrone*. A paragraph of this text has already been published in Valleriani, *Galileo Engineer* 177–178.

and we insert it into the barrel of an Arquebus, perfectly drilled along a straight line using the greatest of skill, then, if the opening towards the firing mechanism is closed and we pull it out [the stick] almost completely, this will be possible only with a certain degree of effort, as it is opposed by the *vacuum that is created* at the bottom [of the barrel] where the air cannot enter. If we then let go of the stick when it is almost out of the barrel, the vacuum will pull the stick back violently to fill [the barrel] again, since that vacuum can only exist because of violent action on nature. That the Element of Air cannot remain in a state against its nature and against the way it was created by God Almighty, can also be *proved* in another way. If the opening between the barrel and the firing mechanism is closed and we insert the aforementioned stick, we experience that we can do this only by means of a certain degree of effort, because the Air is a body and bulks itself together [*ammassarsi*], and if once we have pushed it down as far as is possible, we let it go, the air is subjected to violence since it cannot remain compressed together [*constipata*], but will burst out, and with fury push the stick out and so return (once the violent action stops) to its natural state. Hence it is clear that if we insert a ball when the opening between firing mechanism and barrel is closed, since the packed air wants to go back to its natural state, it pushes it out violently. This therefore shows that the vacuum cannot exist and that this Element [Air] cannot stay in a state against its nature as the Creator created it.

One can prove moreover that no vacuum can exist also by means of those glass vessels used by women to decrease and partially empty their breasts of the milk which comes so abundantly two or three days after giving birth, because if the newborn children do not empty them, they would be caused hardness and very severe pains if they did not empty their breasts. These [vessels], as is well known, are constituted by a body with a hole large enough so that, when they press the vase on the breast, the nipple comfortably enters it. On the other side, they [the vessels] have a neck long enough to be taken into the mouth and, once the Air inside is sucked out, the milk follows immediately out of the breast. And it works [sc. it can be proved] also by means of those bulbous glasses that are often used to achieve the same goal.

[The women] take a glass cruet with a neck on the upper part, which is wide enough to be able to contain the nipple of the breast, and they warm its body up [of the cruet] very well by means of fire until the heat, penetrating the thinness of the glass through the vacuums [pores], pushes the air out from it and fills the body of the cruet with a very thin

vapour, and when the aforementioned vessel [the cruet] is warm enough, they immediately place the opening of the neck of the cruet at the breast, placing the nipple into it, and since that thin igneous vapour cannot remain in [the vessel], it exits through the vacuums [pores] of the glass, through which it [the vapour] penetrated it [the glass], and so begins rising upwards to its place: although it is transformed by the surrounding air into aerial substance, and since through these small pores, which are very thin, the air cannot enter, and since the vacuum cannot exist [persist], the vessel which cannot stay empty, immediately pulls milk from the breast, and by emptying it [the breast], [the cruet] fills itself, and when it is completely full, it ceases drawing [milk], in the same way as, if it is open at a certain position, one lets the Air enter into it.

Similarly the fires that are set at the mouths of furnaces (within which stones, lime mortar and earth vases are fired) are pulled into those furnaces by the vacuum. This happens because the vapour of the fire, once it has pushed out the Air which is inside, vanishes and evaporates upwards and, as the fire is at the mouth of the furnace, it blocks it [the mouth] and the Air cannot enter. When the vapour has vanished, since the vacuum cannot exist [persist], the fire fills the empty space that would be created in the furnace because, when the vapour exits, the opening for the Air is closed and, as the vacuum cannot exist [persist], the fire substitutes for the vapour.

From these things the high excellence becomes clear by means of which Hero has proved that the vacuum cannot exist except by means of violent action and outside natural conditions.

Aleotti's theoretical notes to Hero's preamble describe five experiences, all of them pertaining to real life, though not necessarily common. The first two experiences could have been common only for those who had knowledge of the arquebus. Two experiences were related to medicine and, in particular, to devices that extract milk from the breasts of women after they have given birth; the last involves the functioning of furnaces. Aleotti does not refer to common and basic observations such as the fall of a heavy body. In the context of the sixteenth century, the experiences Aleotti refers to are elaborated arrangements which had already proven to be replicable and could not be contested in reference to their execution.

The overall goal of Aleotti's chapter is to show that void can be created artificially and violently. The medieval principle that nature abhors a vacuum, therefore, is interpreted in its weak variant, namely, that nature alone cannot create a vacuum, but that it can nevertheless be created artificially.

## The Role of Experience

For the sake of brevity, we will analyze only three of the experiences adduced by Aleotti: the first two with the arquebus barrel and the one that employs fire to warm up the milk pump.

The experience with the latter instrument shows only that if a warmed cup is placed appropriately, the milk is sucked out. Aleotti's interpretation of this phenomenon includes the existence of igneous vapour, which is not contemplated within the Aristotelian framework. This hypothesis was obviously not completely new. It had circulated as a possible explanation at least since the end of the thirteenth century<sup>31</sup> and was widely spread thanks to Dante Alighieri's *Divina Commedia*, which contains an advanced meteorology that supposes the existence of such vapour in Canto 24.<sup>32</sup> Aleotti's igneous vapour has three characteristics: a) it is defined as a body able to push away another body if this enters its space; b) it is thin and therefore able to enter a body through its pores and not necessarily through an opening; and c) it flies out of a body when cooling down.<sup>33</sup> Such vapour offers explanations of the functioning of the device, since it is supposed to push out the air, which contrary to the vapour, cannot re-enter the vessel as this is not thin enough. When the vapour exits the device, a vacuum is created. If the vessel is open the milk enters it, but if the vessel remains closed, the vacuum will not be extinguished. Unfortunately, Aleotti did not ask himself what would have happened if a closed sphere full of air were warmed up. We can imagine that, according to the first two experiences, the air inside would be packed and somehow condensed; this is exactly the opposite of what would be expected on the basis of the Aristotelian doctrine. Following this speculation, it is clear that Hero's hypothesis concerning the micro-vacuums and heat as a substance that corrupts air is superior with respect to Aleotti's view. The weakness of the explanation of the latter is prompted by the fact that, although it is described with the aim of showing the possibility of creating a vacuum, it presupposes that a vacuum can be created artificially. The only sensorial data are given by the motion of the milk. The existence of the vacuum is proved by means of the hypothesis concerning

31 The existence of igneous vapour is used in 1282 for example to explain the appearance of lightning in Ristoro d'Arezzo, *La composizione del mondo di Ristoro d'Arezzo* (Rome: 1859).

32 Dante Alighieri, *La divina commedia* (Milan: 2006) 201–202.

33 The existence of such an igneous vapour was presupposed by Galileo as well at the beginning of his research on thermoscopes. For more details, see chapter five of Valleriani, *Galileo Engineer*.

the existence and the nature of the igneous vapour, however, neither of which is however empirically confirmed.

The first two experiences with the arquebus are qualitatively different; they are simpler and more convincing as they involve only one hypothesis concerning air and not the second hypothesis concerning heat and its vapour.

The choice of a firearm barrel is fundamental because of the opening at the bottom. By means of this arrangement, it could be shown that by inserting the ramrod air exits from the barrel. By closing it, the air cannot exit and is compressed. In the same way, it could be shown that by extracting the ramrod with an open barrel at the bottom, air enters and therefore, once the opening is closed, a vacuum can be created (air is not rarefied). Aleotti does not accept Hero's hypothesis on the micro-vacuums.<sup>34</sup> In his perspective, air can be compressed, though he did not use this exact term; at the same time, air is not rarefied, but a vacuum is created. His interpretations of these experiences are clearly non-symmetrical, though they do not contradict each other either. Nevertheless, his arguments were convincing at that time.

### The Use of Experiments

The two experiences with the arquebus are not qualitatively different from the experiences already suggested by Hero concerning an inflated sphere or a sphere from which air is sucked out.<sup>35</sup> Nor are these experiences qualitatively different from those that had been used since the Middle Ages to prove that a vacuum *cannot* exist! One of these experiments is represented by an arrangement constituted of a small basin full of water with a candle inside; the flame is set at a reasonable distance from the water and a glass cylinder. If the glass cylinder is placed over the candle and immersed into the water, the water level within the glass cylinder can be observed to rise.<sup>36</sup> Without taking into consideration the differing conceptions of combustion that explain how

34 In 1867, Keller interpreted the same source and suggested to understand Aleotti, as he would have accepted Hero's suggestion concerning the existence of micro-vacuums. However, the source clearly shows that there is no mention of the hypothesis of the existence of micro-vacuums. For more details, see Keller, "Pneumatics, Automata and the Vacuum in the Work of Giambattista Aleotti".

35 For more details, see the *Proemium* of Hero of Alexandria, "Heronis Alexandrini pneumaticorum libri duo", in Schmidt, *Heronis Alexandrini Opera* 1–29.

36 The role of this experiment in history is largely described in Grant E., *Much Ado About Nothing. Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution* (Cambridge: 1981) 77–80.



air disappears from the glass cylinder, medieval and early Renaissance scholars commonly agreed that this phenomenon could simply be explained on the principle that nature abhors a vacuum, that is, that no vacuum can exist and therefore the water rises within the cylinder.

We therefore face a puzzling historical problem. The same sort of experiments were in fact used over time both to show the impossibility of vacuum and to demonstrate its existence.<sup>37</sup> Indeed, some differences in the apparatus between the earlier and the later experiments could be found, which render the later ones more convincing. Following Alexander Keller,<sup>38</sup> it can be observed that the experimental apparatus took on ever larger dimensions during the sixteenth and the seventeenth centuries. Comparing the small glass cylinder of the medieval candle experiments and the gigantic glass cylinder full of quick-silver used by Evangelista Torricelli in 1644 clearly shows that the forces involved in the earlier experiments were not sufficient to draw indubitable conclusions.<sup>39</sup>

Another aspect is certainly related to the materials used to set up the experiments. The impressive development of metallurgy during the fourteenth and fifteenth centuries, especially driven by the diffusion of firearms, increasingly allowed the employment of iron or cast iron instead of wood.

Even considering such differences, however, it is a fact that some of the medieval experiments do not fundamentally differ from those codified by Aleotti, and it is also a fact that experiences like those of the arquebus were, at this point, considered to be indubitable, in contrast to the medieval ones. The reason for such different consequences should therefore not be sought in the analysis of the experiments themselves, but rather in the general conceptual frameworks within which these experiments were conducted. Aleotti concluded his theoretical chapter with the following words: 'the vacuum cannot exist except through violent action and outside natural conditions'. As mentioned before, this is an alternative formulation of the weak version of the principle according to which nature abhors a vacuum. During the Middle Ages, stating that a phenomenon can happen only outside of natural conditions meant that the phenomenon was considered impossible to realize. At the end of the sixteenth century, however, it only meant that additional action beyond

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37 The same issue is discussed by E. Grant as well in *ibidem*, 95–100.

38 Keller, "Pneumatics, Automata and the Vacuum in the Work of Giambattista Aleotti".

39 Torricelli describes his experiment in a letter to Michelangelo Ricci on June 11, 1644. For an English translation of Torricelli's letter, see Middleton W.E.K., *The History of the Barometer* (Baltimore, Maryland: 1964) 23–24.



the course of nature was needed to realize the phenomenon. Once achieved, this phenomenon finally belonged to nature, that is, it was neither supernatural nor irrational or magic, and could or rather should also be explicable.

Finally, the slightly different experimental arrangements combined with a change of attitude concerning the relationship between art and nature seem to have been the conditions that allowed the relevance of experiments to increase within the frame of scientific practice.

The interpretation of the relation between art and nature, as first defined by Aristotle, was heavily discussed from the Middle Ages on. The relation between products of art, for instance in mechanics and pneumatics, and nature, depended on the possibility of furnishing rational explanations of pneumatic phenomena which, at the same time, could also be used to explain natural phenomena. Aleotti's theoretical chapter is situated between the idea of an opposition between art and nature, and the notion that both domains are governed by the same rules. The latter interpretation forms the basis of modern science.<sup>40</sup> The emergence of the products of art in scientific debates traditionally framed by natural philosophy was especially due to the work of professionals such as engineers and architects, who, for this reason, also correspondingly improved their social positioning during the sixteenth century.<sup>41</sup>

### The Emergence of Empiricism

Aleotti's scientific practice adopts an empiricist manner, as it stresses the fundamental role of experience. Like Aleotti, contemporary practical mathematicians, engineers, and engineer-scientists were negotiating the boundaries between their disciplines and natural philosophy, obviously in their own favour. Their aspiration was to be allowed to speak about natural phenomena on the basis of their experience with the products of art. A marginal note by the famous chief engineer of the Grand Duke of Tuscany, Bernardo Buontalenti, clearly shows this: at the end of the sixteenth century, Buontalenti, while

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40 For a study on the change of interpretation of the products of art during the sixteenth century and directly related to pneumatic machines, see Valleriani, "The Garden of Pratolino: Ancient Technology Breaks Through the Barriers of Modern Iconology".

41 For more details, see Biagioli M., "The Social Status of Italian Mathematicians, 1450–1600", *History of Science* 27 (1989) 41–95.

commenting on a book about the impossibility of perpetual motion,<sup>42</sup> wrote in the margin that *art won against nature* (in his time).<sup>43</sup>

A call for more adherence to observed phenomena, unrelated to totalizing conceptual schemes and to be explained only by means of one or another theoretical hypothesis, was the message of the professionals, while improving their social status. It is not particularly satisfying, however, to reduce the emergence of empiricism in scientific practice to a mere social process. There are objective reasons for calling the method of the professionals 'empiricist', in contrast to the use of experiments in the Middle Ages.

The experiment with the candle and the cylinder was part of an all-encompassing conceptual frame, developed to furnish explanations of the entire structure of the cosmos. From the thirteenth century, the distinction between universal and particular causes was held to be true. Turning our attention to the candle experiment, we can see that, to avoid a vacuum, the water rises. In the Aristotelian frame, each element tends to its natural state; thus, for example, water does not move upward toward the air. In the experiment, however, this takes place, so as to avoid the existence of a void, since nature abhors a vacuum. This means that the principle of the abhorrence of a vacuum is more relevant or prior to the principle that the elements move toward their natural place. In medieval terms, the abhorrence of a vacuum is a universal cause and the principle involving the natural movements of the elements is a particular cause. The reason for this distinction lies in a series of consequences drawn by Aristotle to show that the world, as observed, would not exist if void were admitted.<sup>44</sup> For the purpose of the present work it is not relevant to know exactly which reasons were given. It is enough to know that ever since the thirteenth century it had been a common belief that void was a question, say, of life or death, whereas the motion of elements contrary to their natural tendencies was a problem with which natural philosophy could cope. The Aristotelian conceptual framework was a powerful explanatory theoretical system and in place before anyone had the idea to experiment with a candle or, to be more

42 Mellini Domenico, *Discorso di Domenico Mellini nel quale si prova contra l'oppenione di alcuni non si potere artificialmente ritrovare, ne dare ad un corpo composto di Materia corrotibile un Movimento, che sia continovo e perpetuo* (Florence, Appresso Bartolomeo Sermatelli: 1588).

43 For more details, see Valleriani, "The Garden of Pratolino: Ancient Technology Breaks Through the Barriers of Modern Iconology", and chapter six of Valleriani, *Galileo Engineer*.

44 For the distinction between universal and particular causes, see Grant, *Much Ado About Nothing. Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution* 69–70. For an analysis of Aristotle's doctrine from this perspective, see also *ibidem* 5–8.

precise, the idea of placing such experiences within that conceptual framework. The candle observation could be inserted into the framework and those concepts could be used to describe it, but the experiment does not have any conclusive character.

On the contrary, Aleotti's experiments have only a conclusive character, and paradoxically they work because they are no longer connected to a general conceptual structure. Considering the fact that he was an engineer, Aleotti was very well educated. However, his education did not bring him into close contact with the Aristotelian doctrines. His personal library, remarkably voluminous for an engineer, did not contain any work on natural philosophy or any commentaries on Aristotle's work.<sup>45</sup> Aleotti, in other words, did not have to retain the world system by avoiding void. His world was perfectly understandable even with a void in the barrel of the arquebus. His arguments start with the experiments and not vice versa, unlike those of the medieval Aristotelian commentators. Before scholars like Galileo and Descartes began to build an alternative conceptual system to explain the world, professionals like Aleotti were working with a more flexible conceptual system (or lack of it) and began to codify fundamental observations and experiments for the next generation of scholars. The power of Aleotti's empiricism derives from the weakness of his interpretative structure. As his interpretation of the experiment with igneous vapour shows, Aleotti was not even able to avoid clear contradictions at a linguistic level. Ultimately, the power of his arguments was also enhanced by the fact that he was the author of numerous impressive enterprises, which, together with those of the other engineers, make the traces of the Renaissance epoch so attractive for us even today.

In conclusion, the emergence of empiricism in modern scientific practice also began with a process that involved engineers at the end of the sixteenth century, and was powered by the fact that their realizations worked particularly well, were appreciated and, considering the frame of the revolution in the art of war, also needed. The demonstrative power of their experiments and arguments was granted by the use of a conceptual system which did not intend to explain all natural phenomena and which could thus be flexibly adapted according to the task at hand—to accomplish or to explain a given phenomenon. The experiments themselves became more convincing because of the augmented dimensions of the apparatus and because of the use of more resistant materials for the devices employed. In other words, the works of

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45 For an analysis of Aleotti's library, see Fiocca A., " 'Libri d'Architettura et Mathematica' nella biblioteca di Giovan Battista Aleotti", *Bollettino di storia delle scienze matematiche* 15, 1 (1995) 85–132.

sixteenth-century engineers represent a laboratory used later by scholars and philosophers during the seventeenth century.

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## Visual Perception and the Cartesian Concept of Mind: Descartes and the *Camera obscura*

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### Summary

In the second book of his *Essay Concerning Human Understanding*, John Locke famously described the human mind as ‘a closet wholly shut from light, with only some little openings left, to let in external visible resemblances, or ideas of things without’. Locke’s simile, based on a well-known optical device, the *camera obscura*, proved to be a highly influential metaphor of what has been called by many commentators ‘the Cartesian paradigm of cognition’. What is meant by this term is an indirect realist view of the human cognition. In the last decades, however, this line of interpretation has been challenged by scholars attributing to Descartes, Arnauld, and Locke direct realist, externalist, or more sophisticated internalist accounts of the mind–world relation. Though these claims, I assume, are basically sound, they are weakened by the fact that the *camera obscura* unquestionably dates back to the seventeenth century as a cognitive metaphor. Since, to the best of my knowledge, no attempt has been made to explain away this latent contradiction, in this paper I intend to make up for this lack by reconstructing the historical role of the *camera obscura* in cognitive contexts. My conclusion will be that far from undermining a more balanced view, a closer look at the way in which this optical device entered the philosophical stage may provide good reasons to doubt the myth of the ‘*camera obscura*-model’. My understanding of the issue rests on three considerations. (1) The power of the metaphor stems from the fact that any perceptual acquaintance with the world requires a set of modifications (limitations, replacements or substitutions etc.) much in the same way as scientific instruments transform physical data. (2) These modifications do not rule out a direct cognitive contact with the environment. (3) Consequently, what seems to be highlighted by the metaphor is not so much the enclosed nature of the mind, as the manner in which our cognitive machinery comes into contact with external reality by setting up conditions under which external objects can present themselves to a finite being.

In a widely known passage of his *Essay Concerning Human Understanding*, John Locke compares the human mind to a dark room which the light can enter only through some tiny holes or openings:

external and internal sensation are the only passages [...] of knowledge to the understanding. These alone, as far as I can discover, are the windows by which light is let into this dark room. For, methinks, the understanding is not much unlike a closet wholly shut from light, with only some little openings left, to let in external visible resemblances, or ideas of things without: would the pictures coming into such a dark room but stay there, and lie so orderly as to be found upon occasion, it would very much resemble the understanding of a man, in reference to all objects of sight, and the ideas of them.<sup>1</sup>

Locke's famous image is based, beyond doubt, on a well-known optical device which was highly popular throughout the seventeenth century, the *camera obscura*. It is therefore no wonder that this simple and enlightening metaphor of the human understanding proved to be very appealing to posterity. Since the model of the *camera obscura* is frequent in early modern philosophical texts<sup>2</sup>—it can be found in Descartes, Malebranche, Locke, and others—many commentators have supposed that it described the common predicament of those thinkers who, like Descartes and his followers, embraced *indirect realism*. This reading certainly has its merits. Obviously, strong connections exist between that optical device and the theoretical concerns of the early modern philosophy of mind, and it is hard to see what other message can be carried by this metaphor, if not the lesson of indirect realism. As a consequence, it has been a common claim in the history of philosophy that Descartes's epistemology posits a 'veil of ideas' between us and the world.<sup>3</sup> According to this

1 Locke John, *An Essay Concerning Human Understanding*, ed. P. Nidditch (Oxford: 1975) 2.11.17.

2 Cf. Yolton J.W., *Perceptual Acquaintance from Descartes to Reid* (Minneapolis: 1984) esp. 60–61 and 125ff. The authors referred to there include John Locke, Robert Hooke, and Henry Grove (though the latter used another perspective machine, the so-called *perspective box*, in a role equivalent to that of a *camera obscura*). For other seventeenth-century discussions of the subject see the passages quoted in the main text. Even late scholastic treatises deal with the phenomenon in an epistemological context. See for instance Francisco Alonso's (1600–1649) discussion of the *camera obscura* in his *Disputationes in tres libros Aristotelis De anima* (Alcalá, Antonio Vázquez: 1640) 7.1.10, 138b. On the development of the *camera obscura* and its cultural role in the early modern period see Grau O., *Virtual Art: From Illusion to Immersion*, trans. G. Custance (Cambridge, MA: 2003) 53ff.; Lefèvre W. (ed.), *Inside the Camera Obscura—Optics and Art under the Spell of the Projected Image* (Berlin: 2007); Hammond J.H., *The Camera Obscura: A Chronicle* (Bristol: 1981); Zittel C., *Theatrum philosophicum—Descartes und die Rolle ästhetischer Formen in der Wissenschaft* (Berlin: 2009) 288ff.

3 A good critical survey of this position is offered in Wilson C., "Discourses of Vision in Seventeenth-Century Metaphysics", in Levin D.M. (ed.), *The Sites of Vision: The Discursive*



line of thought, cognition takes place in the mental realm, in an *inner space* which is cut off from the external world, and we are not directly aware of material things, but of their proxies, representations, or ideas. This doctrine has been referred to as the ‘Cartesian paradigm of *camera obscura*’ or ‘Cartesian theatre’.<sup>4</sup> Both images suggest that we live forever shut in behind a veil of perceptions, and have contact with the world only through mental items, which we are to contemplate in order to make inferences about the external world.<sup>5</sup>

There is certainly an element of truth in this account insofar as both the dark room (the *camera obscura*) and the image of the theatre date back to the seventeenth century as cognitive metaphors. Nevertheless, in the case of philosophical metaphors it is always crucial to ask precisely what elements of the picture are relevant, and what aspects of reality they illuminate. In what follows, I will argue that the most important lesson of the *camera obscura* metaphor has no necessary connection with the much-debated question of *direct* versus *indirect* realism, and for this reason it cannot be employed as an argument for or against either epistemological claim in the context of the seventeenth century. By doing so, I do not mean to deny the cognitive relevance of the *camera obscura*. On the contrary, my aim is to provide an alternative interpretation of its epistemological role by taking into consideration the way in which it actively rearranges the physical data in its enclosed space. Laying stress on the activity inherent in the workings of this instrument, I also wish to emphasize the social context of its use. Following the seminal works of Steven Shapin and Simon Schaffer, I propose to consider the *camera obscura* as a set of practices embedded in the early modern context of the production

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*Construction of Sight in the History of Philosophy* (Cambridge, MA – London: 1997). A more fine-grained account of the ‘veil of perceptions’ problem would have to take into consideration the crucial distinction between primary and secondary qualities. Some commentators claim that according to Descartes sensory qualities do constitute a ‘veil’, even though the perceptions of the primary qualities do not. Cf. Pessin A., “Mental Transparency, Direct Sensation, and the Unity of the Cartesian Mind”, in Miller J. (ed.), *Topics in Early Modern Philosophy of Mind*, Studies in the History of Philosophy of Mind 9 (Springer: 2009) 1–37.

4 See for instance Cray J., *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge, MA – London: 1999).

5 An oft-cited and classic rendering of this position can be found in Richard Rorty’s *Philosophy and the Mirror of Nature*: ‘In Descartes’ conception—the one which became the basis for “modern” epistemology—it is representations which are in the “mind”. The Inner Eye surveys these representations hoping to find some mark of their fidelity [...]. Such an inner arena and its inner observer permit[ted seventeenth-century thinkers] to pose the problem of the veil of ideas, the problem which made epistemology central to philosophy’.—Rorty R., *Philosophy and the Mirror of Nature* (Princeton: 2009) 45, 50.

of reliable perceptual knowledge, rather than as a material device which, by itself, suggests a certain model of seeing.<sup>6</sup> Connecting the issue to the knowledge-making practices of the age may help us to relocate the relevant debates in the early modern project of the advancement of learning, a project based on new values and orientations. Accordingly, what the image of the *camera* incorporates is much more a set of values and ideological motivations inherent in the *practice* of the modern science, than self-evident theoretical features of human cognition.

In the next two sections, I will first give a brief survey of the role the *camera obscura* played in Descartes's philosophy of mind, before addressing the issue of direct *versus* indirect realist interpretations of Descartes's epistemology. Finally, in the last section, I will turn to the optical instruments which in the early modern age were designed to make new *facts* available to the observer. Central to my thesis is that in order to fulfil this objective, scientific instruments set up artificial conditions for phenomena to present themselves to the observer who—as a human being—always has finite mental capacities. I will argue that the power of the *camera obscura* as a cognitive metaphor stems especially from the fact that our perceptual acquaintance with the material world also requires a whole range of transformations much in the same way as scientific instruments and experiments do.

### Vision, Cognition, and the Camera Obscura

Darkened rooms and shadowy chambers—where the light enters only through some artfully hidden windows—were popular in baroque architecture. Libraries, crypts, sacristies, and reading rooms are so many scenes designed to enhance the interior life of the soul. The *camera obscura* figures in Malebranche, in a philosophical dialogue, as an ideal place of thinking:

I must leave these enchanted places which delight our senses, and which, by their variety distract a mind like mine. [...] Let us withdraw to your study in order to retreat into ourselves more easily. [...] Let us go in... Sit down... What is there here to prevent us from entering into ourselves to consult reason? Do you want me to block all the light passages, so that

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6 See especially their *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: 1985), and Steven Shapin's programmatic work: *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago – London: 1994).

darkness eclipses everything that is visible in this room and can strike our senses? No, my dear man. [...] Simply draw the curtains.<sup>7</sup>

In the cognitive context, the *camera obscura* appears on two distinct levels. First, it provides a useful model of seeing; second, it gives us a more general model of cognition (as the passage quoted from Locke shows). Turning to Descartes, I will deal with these two questions separately.

With respect to the first, it is worth noting that what Descartes explains by the *camera obscura* in his 1637 *Optics* is the working of human eyes, not that of the mind.<sup>8</sup> His point can be summarized briefly: human eyes enclose an inner space which the light can enter only through a unique hole—the pupil—to trace the portrait of external objects in the inverse position on the *retina*, a light sensitive tissue lining the inner surface of the eye, from where the optic nerves stem.<sup>9</sup> This theory of Descartes's closely follows the principles of Kepler, who had been the first to localize sensory images—the basis of the whole visual process—on the retina, instead of the inner surface of the lens.<sup>10</sup> Descartes summarizes the Keplerian achievement as follows:

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- 7 Malebranche Nicolas, *Dialogues on Metaphysics and on Religion*, ed. N. Jolley – D. Scott (Cambridge: 1997) 3–5; *Œuvres de Malebranche*, ed. G. Rodis-Lewis, 2 vols. (Paris: 1992) 669, 671. Cf. Wilson, “Discourses of Vision” 117. For the ‘Cartesian gesture of retreat into an isolated and enclosed space’ see Lyons J.D., “Camera Obscura: Image and Imagination in Descartes’s *Meditations*”, in Rubin D.L. – McKinley M.B. (eds.), *Convergences: Rhetoric and Poetic in Seventeenth-Century France* (Columbus: 1989) 179–180.
  - 8 Descartes’s medical approach was far from being exceptional. Vopiscus Fortunatus Plempius also used the *camera obscura* to explain the ‘modus visionis’. On his achievement and the medical context of Descartes’s explanatory model see Vanagt K., “Early Modern Medical Thinking on Vision and the Camera Obscura: V.F. Plempius’s *Ophthalmographia*”, in Horstmannshoff M. – King H. – Zittel C. (eds.), *Blood, Sweat and Tears—The Changing Concepts of Physiology from Antiquity into Early Modern Europe* (Leiden: 2012) 569–593.
  - 9 See Descartes René, *Optics* V. in idem, *Œuvres*, ed. C. Adam – P. Tannery, 12 vols. (Paris: 1996) VI, 114–147 (hereafter referred to as AT); English translation: *The Philosophical Writings of Descartes*, ed. J. Cottingham – R. Stoothoff – D. Murdoch, 2 vols. (Cambridge: 1984–1985) I, 166ff. (hereafter referred to as CSM).
  - 10 Cf. *Paralipomena ad Vitellionem*, V.2 (*Modus visionis*), in Kepler Johannes, *Opera omnia*, ed. C. Frisch (Frankfurt – Erlangen: 1859) II, 232ff. (The Keplerian description of the eye as a *camera obscura* is provided on 260ff.) *Dioptrice*, prop. 61. Ibidem 538–539. On Kepler’s theory of vision see Hamou P., *La mutation du visible: essai sur la portée épistémologique des instruments d’optique au XVII<sup>e</sup> siècle, vol. 1. Du Sidereus Nuntius de Galilée à la Dioptrique cartésienne* (Paris: 1999) 216ff. Its impact on Descartes is also discussed in detail in Hamou P., *Voir et connaître à l’âge classique* (Paris: 2002) 72ff. See also the third chapter

Suppose a chamber is all shut up apart from a single hole, and a glass lens is placed in front of this hole with a white sheet stretched at a certain distance behind it so that the light coming from objects outside forms images on the sheet. Now it is said that the chamber represents the eye; the hole the pupil [...], and the sheet the internal membrane which is composed of the optic nerve-endings.<sup>11</sup>

Not the least remarkable aspect of this description is that Descartes, following Kepler, tries to shed some light on the *natural* operation of the eyes by comparing it to an *artificial* instrument. The account given by Kepler early in the seventeenth century cut across the dividing line which in earlier times had set apart the work of nature from artificial products of human industry. To appreciate this move, it is worth recalling that the primary aim of Kepler's 1611 optical work had been to corroborate the telescopic observations made by Galileo in the previous year. Aristotelian critics of Galileo had refused to accept these discoveries pointing out that they had not been based on the immediate deliverances of the senses which, according to the Aristotelian doctrine, did not err under natural conditions. Galilean observations had been mediated by some skillfully constructed instruments, tricky lenses, which, not unlike the amusing artifacts described by Giovanni Della Porta in his book on natural magic, might ingeniously distort the human sight. Obviously, Kepler embraced the best strategy against the opponents, when he focused on the *camera obscura*, another well-known piece of the magical repertoire of della Porta,<sup>12</sup> and made it central to his optical theory. The point suggested by this move is this: 'natural' human sight depends on the optical construction of the eyes in the same manner as man-made spyglasses, telescopes, and dark chambers depend on their own; what we find in each case are just transparent lenses, different refractions, and various pictures and images produced by them. Thus, Kepler met the objections of Galileo's opponents by showing that the working of the sense organs—which they took to be natural and contrasted with man-made devices—is based on the very same principles as optical instruments. Following this line of thought, Descartes also describes the human senses as complex instruments whose operation can be analyzed in mechanical and mathematical terms. This approach—the 'instrumentalisation of seeing' as

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of Wolf-Devine C., *Descartes on Seeing: Epistemology and Visual Perception* (Carbondale: 1993) 51ff., especially 53–56.

11 Descartes, *Optics* v., AT VI, 114–115 (CSM I, 166).

12 Cf. Reeves E., *Galileo's Glassworks: The Telescope and the Mirror* (Cambridge, MA: 2008) 78.

Philippe Hamou termed the change—allows us to understand the function of the senses without any reference to the soul. By *analysis*, that is to say, by dismantling the organs, we can take them apart, and put together the constituents again. The Cartesian method of resolution and composition can be seen at work in Descartes's description of the eye as a camera obscura:

[Take] the eye of a newly dead person (or failing that, the eye of an ox or some other large animal); you carefully cut away the three surrounding membranes at the back so as to expose a large part of the humour without spilling any. Then cover the hole with some white body thin enough to let light pass through (e.g. a piece of paper or an eggshell), and put this eye in the hole of a specially made shutter so that its front faces a place where are various objects lit up by the sun, and its back faces the inside of the room where you are standing. [...] Having done this if you now look at the white body, you will see there (not perhaps without wonder and pleasure) a picture representing in natural perspective all the objects outside...<sup>13</sup>

In Descartes's technical reconstruction of the sense-organ, the viewer can easily observe how the retinal image, *imago* (image), or *pictura* (picture), as Kepler and Descartes call it, comes about. The sensory image produced by the light is a tiny real portrait of the objects in the field of vision. Nevertheless, they are not true representations of external bodies; the retinal images do not map, as it were, or copy the visual objects, without transforming them and changing their nature and character in many respects. The *pictura* (the *picture*) represents extended bodies in two dimensions and in an inverse position. When Kepler employs the term '*pictura*' his choice provides a clue to the understanding of the whole visual process. The suggestion is that sensory images are to be interpreted much in the same way as painted images, produced in accordance with the rules of linear perspective, require interpretation. Visual images fulfil the famous definition of the *pictura* given by Leon Battista Alberti early in the 15th century: the image is the cross-section of the 'visual pyramid' and the picture plane.<sup>14</sup>

13 Descartes, *Optics* V, AT VI, 115 (CSM I, 166).

14 Cf. Alberti Leon Battista, *De pictura / Della pittura* 1.12. (*On Painting: A New Translation and Critical Edition*, ed. R. Sinisgalli (Cambridge: 2011).) For a recent interpretation of the so called "Alberti model" see Andersen K., *The Geometry of an Art: The History of the Mathematical Theory of Perspective from Alberti to Monge* (New York: 2007) 17–22.

## DISCOURS SIXIESME.

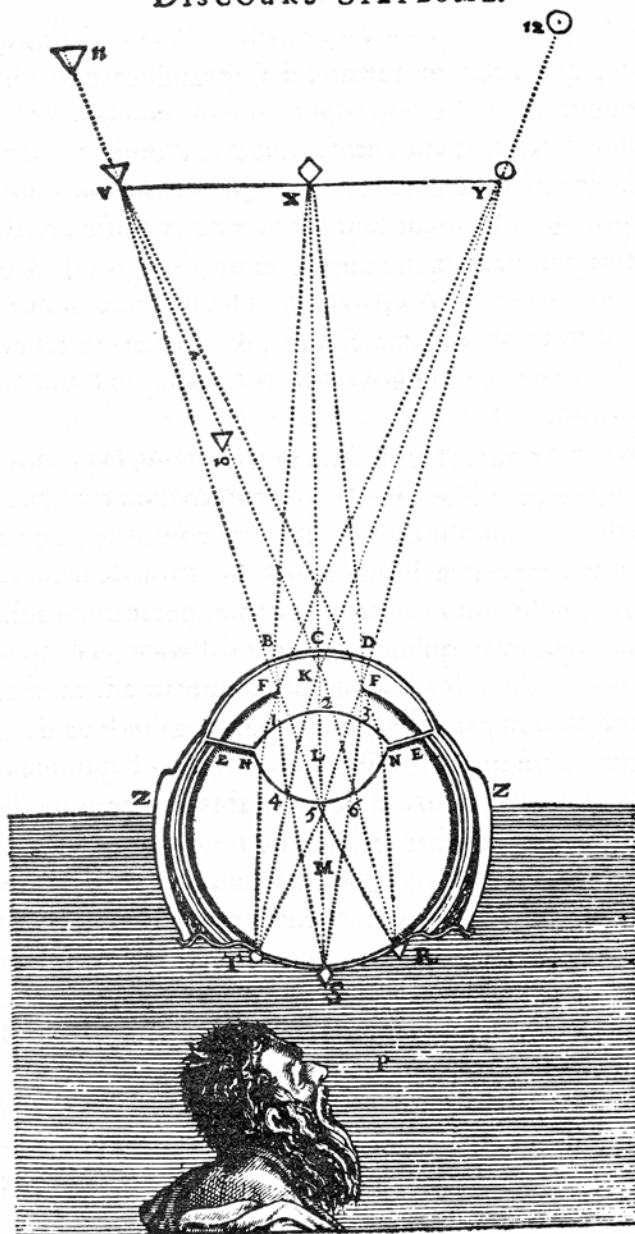


FIGURE 3.1 *The eye as a camera obscura. Illustration from the first edition of Descartes's Optics (1637).*

This point has important consequences. The pivotal stage in the visual process—the formation of the *pictura* on the internal surface of the eye—gives rise to a kind of illusion, as indeed any image does, since perspective construction replaces the original causes with new ones, which produce the same effect in the beholder. Notice that an image (a *pictura*) is, as Descartes often stresses in accordance with the perspectivist tradition, always ambiguous and equivocal. A cross-section of the image plane and the visual rays may represent each and every point on the lines connecting the object with the image plane, so that the mind, in order to assess the distance of any object seen, has to engage in the visual process as an *interpreter*.

### Direct Versus Indirect Realism in Descartes

The above considerations do indeed suggest indirect realism. According to the Cartesian account of seeing, processing retinal images is basically the same task for the mind as interpreting perspective pictures. The information captured in the *pictura*, and transmitted to the brain by the optic nerves, brings about a cerebral image, which in turn gives rise to the appropriate sensation in the mind.<sup>15</sup> The primary sensations of colour and light are interpreted, at last, by means of some natural or acquired procedures of judgement which relate to the constituent parts of the mental image as the habitual judgements of a viewer relate to the lines of a perspective image. What else could this account amount to, other than a very strong form of indirect or representative realism?

Moreover, some statements of Descartes appear to indicate that the *camera obscura*-model holds for the whole cognitive process of seeing. In his *Treatise on Man*, he speaks about those forms or images ‘which [...] the rational soul will *consider directly* when it imagines some object or senses it’.<sup>16</sup> Or, to take another example, in the *Meditations* the reader encounters a whole series of terms which, taken at face-value, seem to imply that the mind is directly acquainted with physical brain-processes, when ‘contemplating’ images produced by external objects in the substance of the brain. ‘I can easily understand’, Descartes observes, ‘that, if there does exist some body to which the mind is so joined that it can apply itself to *contemplate* it [...] whenever it

15 See the fourth discourse of Descartes's *Optics*: AT VI, 109–114 (CSM I, 164–166).

16 Descartes René, *Treatise on Man*, AT XI, 177. English translation: Descartes René, *The World and Other Writings*, ed. S. Gaukroger (Cambridge: 2004) 149. Emphasis added.



pleases, then it may possibly be that very body that enables me to imagine corporeal things'.<sup>17</sup>

Accordingly, in the process of sense-perception (Descartes seems to suggest) the soul attends to the images printed on the surface of the *pineal gland*, and when the 'images on the gland are not imprinted by external objects, but by the mind itself, which fashions and shapes them in the brain, in the absence of external objects', then the mind has imagination.<sup>18</sup> Here we have almost all the relevant constituents of the *camera obscura* model of human cognition, and hence it is just a short step—which an indirect realist is ready to take—to construe ideas themselves as internal objects of mental intuition. This step appears also to be taken by Descartes, who considers that one has 'pure understanding' when the soul does not contemplate bodily images in the brain, but 'turns toward itself and inspects one of the ideas which are within it'.<sup>19</sup>

Though there are many further passages in Descartes which could support this reading, one has good reasons to doubt that this was Descartes's considered view. In recent decades many commentators have challenged the traditional, indirect realist reading of Descartes by calling attention to other features of his thought that should alert us against this interpretation.<sup>20</sup> First, in the *Optics* Descartes himself warns against considering the soul as a *homunculus* sitting in our head as it were, and contemplating some cerebral images:

Now, when this picture thus passes to the inside of our head, it still bears some resemblance to the objects from which it proceeds. [...] [H]owever, we must not think that it is by means of this resemblance that the picture causes our sensory awareness of these objects—as if there were yet other eyes within our brain with which we could perceive it.<sup>21</sup>

17 Descartes René, *Meditations on First Philosophy, Sixth Meditation*, AT VII, 73 (CSM II, 51), emphasis added.

18 Descartes René, *Conversation with Burman*, 16 April 1648, AT V, 162. English translation: *The Philosophical Writings of Descartes*, vol. 3. *The Correspondence*, ed. J. Cottingham – R. Stoothoff – D. Murdoch (Cambridge: 1991) 344–345 (Hereinafter referred to as CSMK).

19 Descartes, *Meditations on First Philosophy, Sixth Meditation*, AT VII, 73 (CSM II, 51).

20 Recent examples of this trend include Alanen L., *Descartes's Concept of Mind* (Cambridge, MA – London: 2003) 128–130; De Rosa R., *Descartes and the Puzzle of Sensory Representation* (Oxford: 2009) 13–14; Guenancia P., *Descartes, chemin faisant* (Paris: 2010) 116ff., and especially Brown D., "Objective Being in Descartes: That Which We Know or That By Which We Know?", in Lagerlund H. (ed.), *Representation and Objects of Thought in Medieval Philosophy* (Hampshire: 2007) 135–153, and references there.

21 Descartes, *Optics* VI., AT VI, 130 (CSM I, 167).



Consequently, the expressions which seem to claim that the soul beholds physical states of the brain, can best be understood as metaphorical. Instead, the true psycho-physical connection is indicated in the following passage: 'we must hold that it is the movements composing this picture, which acting directly upon our soul in so far as it is united to our body, are ordained by Nature to make it have such sensations'.<sup>22</sup> In this account of the visual process, the expression 'picture' is clearly devoid of all pictorial content. Cerebral images which occasion different sensations are just different motions in the brain resulting from external causes. Descartes does not deny that these impressions can retain some resemblances with their original cause. What he does deny is the claim that they represent by virtue of this resemblance. There is no point in contemplating such images in the literal sense of the word, since they do not represent as pictorial images do. The way in which they contribute to the visual process can be better illuminated by the metaphor of linguistic signs. This is what we find in a famous passage at the outset of the *Treatise on Light*:

Although everyone is commonly convinced that the ideas that we have in our thought are completely like the objects from which they proceed, I know of no compelling argument for this. Quite the contrary, I know of many observations which cast doubt upon it. As you know, the fact that words bear no resemblance to the things they signify does not prevent them from causing us to conceive of those things often without our paying attention to the sounds of the words. [...] Now if words, which signify something only through human convention, are sufficient to make us think of things to which they bear no resemblance, why could not Nature also have established some sign which would make us have a sensation of light, even if that sign had in it nothing that resembled this sensation?<sup>23</sup>

Descartes holds that the only task the cerebral images have to perform is to 'cause us to conceive of' some qualities. In order to do that, they do not need to bear a resemblance to the object; on the contrary they must be different in many respects. In the *Optics*, Descartes takes the example of perspective images or engravings which, in order to represent as much as possible, have to differ from their model:

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<sup>22</sup> Ibidem.

<sup>23</sup> Descartes, *Treatise on Light* I, AT XI, 3. English translation: Descartes, *The World and Other Writings* 3.

According to the rules of perspective they often represent circles by ovals rather than by other circles, and squares by rhombuses better than by other squares, and similarly for other shapes. Thus it often happens that in order to be more perfect as an image, and to represent an object better, an engraving ought not to resemble it.<sup>24</sup>

What representation requires, according to Descartes, is not resemblance or similarity as such, but a system of mutual correspondences and differences between two given classes of mental and material modifications.

But what about the mental items occasioned by the corporeal signs? And what shall we say about ideas in general? Irrespective of the epistemological status of the brain images, one can insist that ideas should be considered as the immediate objects of cognition. There is, however, another important—though controversial—consideration which may cast doubt on the traditional interpretation: Descartes's extended use of medieval terminology which had been developed from the thirteenth century onward to express a direct realist position in epistemology.<sup>25</sup> The main outlines of the theory to which Descartes refers in the third *Meditation* can be briefly summarized as follows:

Any existing material and immaterial object can be characterized by two different forms of existence. They have, on the one hand, real existence (*esse reale*), which applies to them by virtue of their being material or immaterial creatures in their own right. Any object can obtain, on the other hand, another sort of existence as it becomes the object of a cognitive act of some sort, if a spiritual being comes to cognize it. (This is the so called *esse objectivum*.) In this case, the object begins to exist in the mind of the cognizer as an *object known*. It is crucial to note that both forms of existence pertain to the same object. When I think of the sun, what I am thinking of is not a mental being, the 'sun-in-the-mind-of-the-cognizer', but a material substance, the heavenly body itself, which exists in the sky. In the case of veridical perception, the well-known fact that thoughts belong to the mind does not preclude that the *intentional object* of my thought is the celestial body itself at which the perceptual act is directed. 'The same object obtains'—as Peter Auriol, for example, wrote, in the fourteenth century—'double existence. It exists *realiter* out there in nature, and *intentionaliter* within the mind'.<sup>26</sup> Now, this double existence can

24 Descartes, *Optics* IV, AT VI, 113 (CSM I, 165–166).

25 For a helpful summary of medieval direct realist positions see Perler D., *Théories de l'intentionnalité au moyen âge* (Paris: 2003).

26 Auriol Peter, *Scriptum in primum Sententiarum*, ed. E. Buytaert (Louvain—Paderborn: 1952–1956) 27.2, 18: 'Idem fit in duplici esse: realiter quidem exterius in natura,

be explained in a number of ways. Medieval scholars were divided into opposing groups claiming that the mental component of an intentional act (*id quo cognoscitur*) was or was not itself an object of cognition mediating between the cognizer and the object perceived (*id quod cognoscitur*). I would therefore not like to suggest that all authors who spoke this scholastic language took a direct realist position. Far from it. Rather, the point is that the scholastic model and terminology on which Descartes relies in his *Meditations* was far from being unequivocal in this respect, and many authors from the fourteenth century onward, perhaps the majority, were eager to reject the indirect realist reading of double existence.<sup>27</sup> In the sixteenth and seventeenth century, many philosophers were ready to subscribe to the opinion succinctly expressed by Auriol: 'Human sight does not arrive at the object seen by means of something absolute, as if a *veil* or another medium exists between us and the wall we are looking at'.<sup>28</sup> Therefore, when Descartes stresses that 'the idea is the thing which is thought of in so far as it has objective being in the intellect',<sup>29</sup> one has good reasons to read these words against the direct realist texts of late scholasticism, even if Descartes was far from admitting such a debt.

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intentionaliter vero in mente'. The translation is based on Russell L. Friedman's preliminary new edition of the text available on the Auriol Homepage: URL = <<http://www.peterauriol.net/AURIOL/ElectronicScriptum.html>>.

27 Although not all medieval authors can be regarded as *direct realists*, commentators rightly take direct realism to be a clear preference and the main concern of late medieval philosophers. See for example Dominik Perler's claim in his *Théories de l'intentionnalité au moyen âge*: '[S]i l'on part de la prémisse aristotélicienne qu'une personne dotée de facultés sensitives et intellectuelle doit recevoir des formes d'un objet matériel pour avoir des actes intentionnels dirigés vers cet objet, il est exclu qu'une telle personne soit emprisonnée, pour ainsi dire, dans un monde de phénomènes et d'idées psychiques. Une telle personne est de prime abord en contact avec un objet matériel [...]'. (Perler, *Théories de l'intentionnalité* 30).

28 Auriol, *Scriptum* 27. 2., 17.: 'non igitur terminatur visus ad rem obiectam mediante aliquo absoluto [...]'. Auriol's statement is all the more valuable as he is not otherwise the best example of the direct realist trends in the medieval period. His commitment to the perspectivist tradition and the ontological status of his *esse apparens* pose complex problems in this respect, the analysis of which is beyond the scope of this paper. For the details of Auriol's epistemology see Tachau K.H., *Vision and Certitude in the Age of Ockham: Optics, Epistemology, and the Foundations of Semantics, 1250–1345*, Studien und Texte zur Geistesgeschichte des Mittelalters 22 (Leiden: 1988) 89–104, and Nielsen L.O., "Peter Auriol", in Gracia J.E. – Noone T.N. (eds.), *A Companion to Philosophy in the Middle Ages* (Oxford: 2002) 495–498.

29 Descartes, *Meditations on First Philosophy, First Set of Replies*, AT VII, 102 (CSM II, 74).

In this respect, it is also worth considering another definition of ‘idea’ given by Descartes in 1641: ‘By the term idea I mean in general everything *which is in our mind when we conceive something*, no matter how we conceive it.’<sup>30</sup> The phrase ‘everything which is in our mind’ is ambiguous between the mental and the real existence of the object. In the first sense, the thing which ‘is in our mind’ is a mental item, something that depends on the mind for its existence as such, while on the second reading it is the real object, not admittedly in itself as it exists *in natura rerum*, but as it exists in the mind as the object of a cognitive act. So the question arises whether Descartes’s expressions such as ‘to be in the mind’, ‘objectively’, and so on, describe the way in which the object represented *exists*, or rather the way in which they are *presented* to the mind.

It is not my ambition to solve this well-known interpretative problem. All I wish to suggest is that neither the frequent allusions to the *camera obscura* model of cognition, nor the Cartesian conception of ideas as mental items, frustrate *ab ovo* a direct realist reading of Descartes. If the idea of the Sun is the Sun itself, one can replace the problematic expressions with the above definition of idea, so when we read for instance about a ‘mind grasping an idea’, what we get by this substitution is this: the mind grasps *the thing itself* (for example the Sun shining in the sky), not as it exists in itself but in the way—and here we mean the *mode* of presentation—in which it can be present to a mind, which is to say ‘objectively’.

A possible objection to that direct realist reading is that, if ideas are identical with the things themselves, how can hallucinations and illusions take place? What can be the immediate object of the sight when God or an ‘evil genius’ deceives us? As Descartes puts the question: ‘How do I know that he [viz. the evil genius] has not brought it about that there is no earth, no sky, no extended thing, no shape, no size, no place, while at the same time ensuring that all these things appear to me to exist just as they do now?’<sup>31</sup>

In reply, one can point out that direct realist approaches do not rule out hallucinations. Consider again the case of Auriol, who—after having made a distinction between real and objective existence of the same thing—goes on to note: ‘While someone is looking at a wall God can annihilate it and sustain its vision in the eyes, so that the wall remains *as* the object of the vision (*paries obiectus et visus*) with all its properties, with its original size, and at the given place where it formerly existed.’<sup>32</sup> This is almost exactly the scenario described by Descartes in his first *Meditation*. The fact that the presence or the absence of

30 Descartes, “To Mersenne, July 1641”, AT III, 392–393 (CSMK 185), emphasis added.

31 Descartes, *Meditations on First Philosophy, First Meditation*, AT VII, 21 (CSM II, 14).

32 Auriol, *Scriptum* 27.2, 17.

the wall does not modify the phenomenological character of the visual experience, according to Auriol, does not imply that our experience is directed at an inner, mind-dependent object which can be seen even in the absence of the wall. Direct realists have quite another story to tell. Without going into detail, it will suffice to recall a modern solution which is also applicable to medieval and early modern debates. In the view of some direct realists, the phenomenological character, or the content of the experience—the experience of the wall in the example of Auriol—defines the conditions under which an object, say the wall, can be presented to the mind if the perception succeeds. If it does not—if the perception happens to fail—then there is no real object presented to us.<sup>33</sup> Take for instance the proposition, *I see the rising sun*. One can easily enumerate the relevant conditions under which the corresponding experience (that is to say, the perception of the rising Sun) counts as successful. If I am deceived by an ‘evil genius’, some of these conditions are clearly not fulfilled. However, this does not pose a problem for the proponent of a direct realist view. When the propositional content of the idea defines the ‘conditions of satisfaction’, those requirements are thereby specified whose fulfilment makes a direct cognitive acquaintance with the world possible through the idea. The possibility of illusions arises from the fact that the specification of the conditions (set forth, as it were, by the content of the experience) does not guarantee their fulfilment.

I do not claim that this reading captures Descartes’s intention. Nevertheless, he is certainly open to such an interpretation, which has many proponents nowadays and was also known in the seventeenth century as well. At least one of Descartes’s contemporaries interpreted his thoughts along this line: Antoine Arnauld, who in his 1683 book *On True and False Ideas* did his best to eliminate those pretended intermediaries, or *representative beings*, which could pose a ‘veil of ideas’ between the mind and the world.<sup>34</sup>

To sum up this point: Descartes’s texts are ambiguous between a direct and an indirect realist position. If one accepts the indirect or representative realist reading, the *camera obscura* model must appeal as an attractive metaphor for the cognitive process of perception. If, by contrast, one prefers the direct realist interpretation, the above distinction between the mode of presentation and the object presented might prove useful, since the mode of presentation still has much in common with the *camera obscura*. It may reveal another

33 Cf. Searle J.R., *Intentionality: An Essay in the Philosophy of Mind* (Cambridge: 1983) 38–39.

34 Cf. Arnauld A., *Des vraies et des fausses idées*, ed. C. Frémont (Paris: 1986). English translation: *On True and False Ideas*, trans. S. Gaukroger (Manchester: 1990). On Arnauld’s theory of ideas and the ‘veil of ideas’ problem see Nadler S., *Arnauld and the Cartesian Philosophy of Ideas* (Manchester: 1989).

important feature of the optical device which does not consist of providing a model of indirect realism, but rather calls attention to the crucial fact that any perceptual contact with the surrounding material world is a process of *reconfiguration* of the sensory information according to a set of rules defined by the point of view of the observer. This will be explained in the last section.

### The Camera Obscura and Direct Realism

If the *camera obscura* as a cognitive metaphor does not imply representative realism in the way in which some commentators assume that it does, what can the role of this optical device be in the cognitive context? As we saw in section two, the process of visual perception, even on the most basic, sensory level, implies a set of systematic transformations, replacements, and modifications. Vision in early modern optics is described as a complex process of adjustments, decomposition, and—by means of habitual judgments—interpretation and reconstruction of the external world. It is by virtue of these processes (one might say ‘information-coding protocols’) that visual experience counts as representation in the original sense of the word. In the light of the Cartesian theory, the *re-* particle, by which the noun ‘re-presentation’ is prefixed, conveys almost the same sense as in the verb ‘re-construct’. As *re-construction* is the activity of constructing something again according to a special plan, and with a particular aim, so *re-presentation* means the presentation of the environment according to a certain rule defined by a particular point of view, and a special aim.

There is striking agreement about the nature of this aim in the seventeenth-century: it is the practical interest of a living organism which, in order to survive, needs appropriate information on the surrounding bodies.<sup>35</sup> Thus, in sensation, the crucial role of our cognitive apparatus is to *rearrange* or *restructure* information according to the particular needs of our living body, which has a certain size and a certain position in the environment. This process of rearrangement does not preclude, however, that our representations are directed at the world, and present us with directly real or possible beings

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35 See for example Descartes's view in the *Sixth Meditation* (AT VII, 88) and Malebranche's claims about sensations which give exact information on the relation between the living body and its environment: ‘nos sens sont très fidèles et exacts, pour nous instruire, des rapports, que tous les corps ont avec le nôtre ; mais [...] ils sont incapables de nous apprendre ce que ces corps sont en eux-mêmes [...]’—*De la recherche de la vérité* I. 20. 1., in idem, *Œuvres de Malebranche*, ed. G. Rodis-Lewis (Paris: 1979) I, 139.

which do not depend on the mind for their being. The fact that we do not see things *as* they exist does not imply that in the case of veridical perception we do not see the things *which* exist.

Keeping this in mind, we are in a position to reassess the role of the *camera obscura*-model in the explication of the cognitive process. According to the arguments above, the metaphor directs our attention not so much to the fact that in a *camera obscura* visual experience is always mediated by projected images, but rather the way in which an instrument rearranges the different pieces of information, and defines the conditions under which external objects can make themselves known to a finite being that consists of a mind and a body.

On this interpretation what made the *camera obscura* so attractive to seventeenth-century thinkers was precisely its instrumental and artificial character. Recall for a moment the role this artefact played in Kepler's apology for Galileo. By making it central to his argumentative strategy, Kepler played down the difference between artificial instruments and sensory organs. Bringing out the similarity of their mode of operation, he could explain to the Aristotelian opponents of Galileo that observational situations always contain something artificial and, for this reason, are always liable to distort observed phenomena. Telescopic observations of the phases of Venus or the moons of Jupiter were as much open to this objection as William Harvey's vivisections, or Pascal's research into atmospheric pressure. Let me recall how Peter Dear summarized this standard Aristotelian objection to instrumental observations:

Active interference, by setting up artificial conditions, would risk subverting the natural course of things, hence yielding misleading results; experimentation would be just such interference. Experiments in the inanimate world ran into the same problem: Using a balance with unequal arms to raise a heavy weight (resting on the shorter arm) by using a lighter weight (resting on the longer arm), for example, would misrepresent the relative tendencies of those weights to strive toward the center of the earth.<sup>36</sup>

Early modern observations and experiments, in contrast, require active interference. They manipulate visual data and tend to eliminate the useless elements of the situation in which observation takes place. In doing so, they need to define and display carefully the relevant ones; in short, they require a man-made reconfiguration of the original situation. The constructive method of

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36 Peter Dear, "The Meaning of Experience", in Park K. – Daston L. (eds.), *The Cambridge History of Science*, vol. 3: *Early Modern Science* (Cambridge: 2006) 110.



modern science orders different replacements and regulations, and instead of observing objects *in vivo* it defines an artificial space of observation to examine things according to a set of rules based on strict methodology. Optical instruments do the same. They set up special conditions for the objects in order for them to be seen and manipulate the whole visual process according to the special needs of the observer. Considered from this point of view, Descartes's appeal to the *camera obscura* in his account of vision makes it clear that this is also what human eyes do during the process of sense-perception. The optical lens, as we have seen in Kepler as well, modifies the different pieces of information according to the laws of refraction and the optical system of the eye.

Admittedly, vision *in this respect* is not a direct relation; it is mediated by the retinal image and the whole causal chain which connects the external objects with the mind through the neural system, the brain, and various mental operations which give rise to a complex perception. But once the mental act of seeing is produced by the causal process of vision, the perception itself may display an intentional character of its own, in virtue of which it can be directed at the external objects *immediately*. The basis of this possibility is the distinction between two relations: the causal dependence of a mental item on the external world is not identical with the intentional relation between this item (an idea) and its object. With respect to the latter, perceptions need not be mediated by any proximal mental object, sense-data, representation or anything else. Therefore, the indirect character of the causal chain which gives rise to an act of perception does not entail that human sight cannot be immediately directed at the mind-independent, real objects. What it means, however, is that in order for them to appear, perceived objects have to conform to special conditions defined by the human body and the human soul. What is inherently perspectival in our perceptual acquaintance with the world is the 'mode of presentation'.

At first sight, the reading proposed runs counter one of the most obvious features of the *camera obscura*, the technical simplicity of the device. One might object that a closed box with a tiny hole does not suggest a highly sophisticated model of cognition, and does not seem to do anything like 'manipulate the visual data'. What it does seem to do is to provide a true image which can be considered for all intents and purposes as a reliable representation of the external object. In response, let me recall that seventeenth-century optical literature bears witness to the technical complexity of the *camera obscura*.<sup>37</sup>

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37 See for instance the second book of *Rosa ursina sive sol* written by the famous Jesuit mathematician and astronomer, Christoph Scheiner (1673–1650), who, introducing his camera-based observations of the sunspots, enumerates a number of difficulties inherent



The theoreticians of the early modern age were well aware of the fact that the *camerae* used in astronomical observations never provided true representations of the external objects, and the causes of the inevitable, albeit sometimes imperceptible, distortion was subject to considerable debate.<sup>38</sup> Second, and most important, examination of the problem from a broader point of view will show that manipulation of information does not only occur *inside* the box. When I take the *camera obscura*, a typical piece of the instrumental repertoire of the early modern age, to be a means of rearranging the elements of the observational situation, the suggestion is that it is apt to symbolize the early modern attitude of *active interference* both by its internal and external features.<sup>39</sup>

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even in the most simple form of cameras. Cf. *Rosa ursina sive sol* (Bracciano, Andreas Phaeus: 1630) 73ff. In general, he speaks of problems emerging from the making and use of scientific instruments ('ex instrumentis quorum acquisitio, usus et insitus defectus observatori multum laboris, taedii et curae creant'—cf. *ibidem* 67).

38 A classic description of these errors, and the debates regarding their causes, was provided by Johannes Kepler in the second chapter of his *Paralipomena ad Vitellionem*, especially in propositions VII–VIII, which deal with the distortions which inevitably occur in all *camerae clausae*. Kepler claims that the picture, cast on a screen, confuses the shape of the aperture and that of the objects without ('ex figura fenestrae et rerum quae foris sunt'—cf. *ibidem* II, 161 and chapter V.1 "de vitiata visione"). For a thoroughgoing discussion of the problems involved see Straker S., "Kepler, Tycho, and the 'Optical Part of Astronomy': The Genesis of Kepler's Theory of Pinhole Images", *Archive for History of Exact Sciences* 24 (1981) 267–293. Other possible distortions associated with pinhole images generated in cameras equipped with optical lenses are due to the physical properties of the lenses. Cf. Dijksterhuis F.J., *Lenses and Waves: Christiaan Huygens and the Mathematical Science of Optics in the Seventeenth Century* (New York – Boston: 2004) chapter 2.2.1.

39 Even a cursory survey of the technical diversity and manifold use of the cameras in the early modern age warrants this claim. Besides their longstanding role in astronomical observations, cameras were used in civil or military topographical surveys, and artistic image making. Cf. Kemp M., *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* (New Haven: 1990) 189. In a scientific context, they permitted the researcher to isolate a beam of light and study the laws of propagation, much in the same manner as other scientific instruments had to provide controlled circumstances in the new 'culture of facts' analyzed, among others, by Peter Dear, Steven Shapin, and Simon Schaffer. Even in the field of artistic practice, where cameras were supposed to provide an exact representation of the scene, they reduced it in size, reversed the image, and manipulated the data. As Martin Kemp notes: 'the camera image does typically exhibit certain visual characteristics which are not apparent or less apparent in nature' (*ibidem* 193). Their technical complexity also bears witness to the way they actively interfere with nature. They ranged from cheap and home-made boxes through 'small-scale, portable instruments [...] equipped with lenses in sliding tubes and built-in screens' to more complex devices like William Storer's 'Royal Delineator' (*ibidem* 189–190).

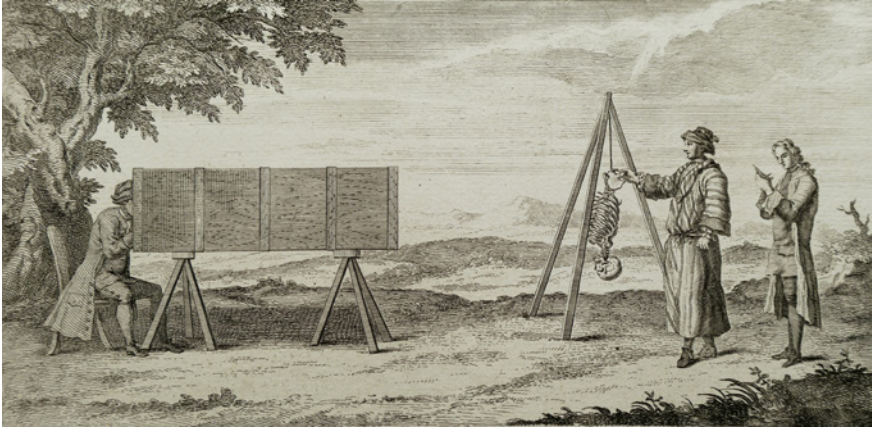


FIGURE 3.2 Camera obscura on the title page vignette of William Cheselden's *Osteographia* (London: 1738).

Since active interference can be observed in the whole process of making and using dark chambers (which for instance help the observer eliminate certain elements of the situation), essential to my reading is that no clear dividing line can be drawn between the internal construction of a device and those social practices whereby it was meant to yield reliable knowledge. By shifting the focus of attention from the projected image inside the *camera obscura* to the 'mode of presentation', my intention has been to stress the way in which man-made devices were designed to make information available to the scientific community by presenting natural objects under artificial conditions. This approach seems to have the advantage over the traditional interpretation that it suggests close connections—or even a continuity—between issues about the instrument's internal way of working and the broad context of social practices of producing and employing instruments in order to facilitate knowledge. When an optical instrument manipulates visual data, the physical production of experimental facts (depending on its design) cannot be dissociated from other—literary, social and ideological—technologies and the whole culture of 'instrumentally mediated knowledge'.<sup>40</sup>

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Thus, images obtained in the *camera obscura* underwent more and more sophisticated optical manipulations: 'The major later improvements concerned the design of the lenses themselves. The scioptic ball, invented by Schwenter in 1636, in which a combination of lenses could be rotated in a socket, proved to be of use in allowing a fixed camera to take in wide-angle views [...]' (ibidem 190).

40 Cf. Wilson C., *The Invisible World: Early Modern Philosophy and the Invention of the Microscope* (Princeton: 1995) 71.

Let me shed some light on this point by making reference to a famous eighteenth-century image of the *camera obscura* on the title page of William Cheselden's *Osteographia*.<sup>41</sup> The subject of investigation, the trunk of a skeleton, is represented in the drawing as hanging upside down in front of a *camera obscura*, so that it produces an upright image bounded by the framework of the box. This way of displaying the object allows the anatomist or the artist to observe and reproduce the bones with the highest exactitude and care, after the exclusion of all unnecessary visual elements of the environment. While the vignette on the title-page informed the reader of the procedures taken by the artist-observer, it carried another message as well. Its role was not confined to providing methodological information; in addition, the image was meant to advertise the accuracy of the observations made by an *honnête homme*. A *camera obscura*, without doubt, produces representations, but, more importantly, it does so in accordance with a new concept of experimentation. The experimental situation, set up consciously by the observer, helps to extract the relevant information by excluding irrelevant factors, rearranging the elements to be observed, and manipulating or filtering the details with respect to a well-defined aim.<sup>42</sup> Thus, the *camera obscura* depicted in the frontispiece figures as a symbol of a highly complex range of practices associated with producing reliable knowledge. It is important to note in this connection that even if the use of the optical device requires a thoroughgoing rearrangement of the observational situation, the pictures's purported message has obviously nothing to do with appearances or 'veil of ideas' skepticism about the objects examined. On the contrary, it seems to serve as a bold proclamation promising the most reliable direct acquaintance with the *things themselves*.

41 Cf. Cheselden William, *Osteographia or the Anatomy of the Bones* (London, William Bowyer: 1733). For a helpful analysis of the title page engraving see Neher A., "The Truth about Our Bones: William Cheselden's *Osteographia*", *Medical History* 54 (2010) 517–528.

42 A clear instance of this rearrangement is the perception of secondary qualities (colours and light) in the visual object. It was widely accepted in the seventeenth century that colour-sensations were caused by the quantitative properties of matter. (The *locus classicus* of this thesis, commonly held, in some form or another, by Galileo, Descartes, Boyle, and many others, is chapter 2.8.10. of Locke's *Essay Concerning Human Understanding*). These properties are arranged in such complex dispositions that a finite mind cannot represent them in detail. Since the receptive tissue of the retina contains a finite number of optic nerves whose endings are of a certain size, the information carried by them to the brain is just a 'simplified' version of the original complexity. Thus, in the process of sense-perception the continuous range of physical causes turns into a patchwork of discontinuous and contrasting sensations. The upshot is that the cognitive machinery of the eye is selective of those pieces of information which are relevant to the observer.

## Conclusion

The *camera obscura* is certainly present in the early modern age as an appealing model of cognition. However, I have argued that it has two different aspects that can be associated with the process of perception. First, by producing an image—a representation—it provides a useful model for indirect realist accounts of the perception. Second, in virtue of its special construction it rearranges all the pieces of information that enter it, and presents the object to the observer in a new and useful way. These two aspects of the *camera obscura* correlate with two different aspects of human cognition. In the first case, the representation produced in the dark chamber can be compared to mental representations considered as proxies for the objects without, while in the second case, the way in which *camera obscura* rearranges visual input appears to recall what philosophers of mind today call the mode of presentation. The latter does not serve as an object of cognition in any ordinary sense; rather it prescribes those conditions which are to be met by the objects of cognition in order for the mind to get into perceptual contact with them.

My proposal has been to emphasize the second aspect of the *camera obscura* over the first, which has hitherto been the privileged concern of epistemology. This move is promising for two reasons. On the one hand, it does justice to the preeminence of the *camera obscura* as an image of the mind in some early modern texts. On the other hand, it helps to bring those features of the device into focus, which relate much more to real scientific practices than to the epistemological question of indirect realism. Like many other man-made instruments, *camera obscura* plays a new and important role in the context of early modern knowledge making practices. It is these practices—with their socio-cultural background—which shed light on the role of the *camera obscura* in a cognitive context, rather than the ‘veil of perception’ story associated with it. Whether or not Descartes was an indirect realist is open to debate. Though I think he was not, the point I want to make does not rest on this assumption. What I do claim is that, even though the *camera obscura* model can be reconciled with both readings, if one takes into consideration the socio-cultural framework in which this device had a prominent role, the second sense explained above fits better into our general picture of the seventeenth century.<sup>43</sup>

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# *The Epistemology of Testimony*







# Testimony and Empiricism: John Sergeant, John Locke, and the Social History of Truth

*John Henry*

## Summary

John Sergeant (1623–1707) was a Roman Catholic controversialist who took issue with leading Anglican divines (John Bramhall, Jeremy Taylor, Henry Hammond, Méric Casaubon, John Tillotson, and Edward Stillingfleet) on the so-called ‘rule of faith’, and with John Locke on the nature of knowledge and certainty. Locke’s marginal annotations in two of Sergeant’s works have led some historians of philosophy (most notably John Yolton and Pauline Phemister) to consider their dispute, but the focus has been on how Locke’s marginal comments reveal his own innovatory epistemology. Sergeant, by contrast, is dismissed as nothing more than a hidebound Aristotelian, an old-fashioned thinker, evidently incapable of seeing the importance of Descartes, much less Locke. In this paper I intend to take Sergeant’s position more seriously and to uncover the real differences in his and Locke’s respective epistemologies. A growing consensus among historians of philosophy sees the origins of Locke’s *Essay* in his ambition to establish epistemological principles which support the case for religious toleration. Locke’s starting point, therefore, was with the (necessarily) *private* thoughts of religious dissenters, and his theory of knowledge was consequently developed in terms of private, individualistic mental states. By contrast, Sergeant, who had been trying for years to convince Anglicans of the superiority of the Roman Catholic rule of faith, carried this over into epistemology and dismissed Locke’s epistemology as ‘ideism’. The Catholic rule of faith, which guaranteed the truth of Catholic teachings, was based *not* on individualistic readings (and personal interpretations) of Scripture (as it was for Protestants), but on accepting the *consensual* doctrines of the Early Fathers, Church councils, and other accredited bodies throughout the continuous history of the Church. For Sergeant, therefore, a sound theory of knowledge should not be based on the way individual minds work, but on the collective consensus of relevant societies. Sergeant can be seen, therefore, not so much as a hidebound Aristotelian, but as an early representative of the social construction of knowledge (which he saw as favouring Roman Catholic teachings), rejecting the individualistic epistemology of John Locke (which he saw as divisive and dangerous to sound religion).

If John Sergeant (1623–1707) is remembered at all today, it is perhaps as a Catholic controversialist who took issue with better known Anglican divines such as John Bramhall, Jeremy Taylor, Henry Hammond, Méric Casaubon, John Tillotson, and Edward Stillingfleet. Others might come across him as a shadowy and somewhat sinister figure who testified to Jesuit involvement in the so-called Popish Plot, while those better informed about the history of English Roman Catholicism in the late seventeenth century, might know him as the last of the Blackloists. That is to say, the last of the followers of Thomas White, or Blacklo (1593–1676), who has been described as ranking alongside John Henry Newman as the most original thinker produced by modern English Catholicism, and the only English theologian worthy to be regarded as a heresiarch.<sup>1</sup> When Sergeant died in 1707 the Catholic preacher-in-ordinary to James II, Sylvester Jenks (1656?–1714), commented that he would rather be recording that Sergeant's [...] faction had been dead [...].<sup>2</sup> It is possible that Jenks knew something that we do not, but as far as we can now tell, the death of Sergeant did mark the demise of the Blackloist faction. Certainly, Sergeant was the last public spokesman for Blackloism, or, as one contemporary referred to it, the 'haeresum Blackloi et Sargentii'.<sup>3</sup>

The Sergeant I want to concentrate on here, however, is the one who has been described as an all but [...] forgotten critic of Descartes and Locke [...]. Descartes was long dead by the time Sergeant began to publish his attacks on the way modern philosophy was proceeding, but Sergeant lumped him and his followers in with John Locke (1632–1704) as what he called 'ideists'.

- 1 Aveling J.C.H., *The Handle and the Axe: Catholic Recusants in England from Reformation to Emancipation* (London: 1976) 115; and Hughes P., *Rome and the Counter-Reformation in England* (London: 1942) 398. For a full account of the life and work of White see Southgate B.C., *"Covetous of Truth": The Life and Work of Thomas White, 1593–1676* (Dordrecht: 1993); and Tutino S., *Thomas White and the Blackloists* (Aldershot: 2008). See also Henry J., "Atomism and Eschatology: Catholicism and Natural Philosophy in the Interregnum", *British Journal for the History of Science* 15 (1982) 211–239.
- 2 Sylvester Jenks, Letter Book, British Library, Additional MS 29612, f. 60. The main works on Sergeant are: Krook D., *John Sergeant and His Circle: A Study of Three Seventeenth-Century English Aristotelians*, ed. B.C. Southgate (Leiden: 1993); and Hay M.V., *The Jesuits and the Popish Plot* (London: 1934); and Southgate B.C., "Beating down Scepticism: The Solid Philosophy of John Sergeant, 1623–1707", in Stewart M.A. (ed.), *English Philosophy in the Age of Locke* (Oxford: 2000) 281–315.
- 3 Lominus M. [Talbot Peter], *Blackloanae Haeresis olim in Pelagio et Manichaeis damnatae nunc denuo renascentis, Historia et Confutatio* (Ghent, s.n.: 1675). On Sergeant's affiliation with Blackloism see Southgate, "Beating down Scepticism" 283–288.

Sergeant's criticisms of Locke are not routinely discussed in historical accounts of Locke's philosophy; after all, Locke himself never felt the need to respond to Sergeant in print, he merely made marginal comments in his copies of the two books where Sergeant attacked his 'ideism', Sergeant's *Method to Science* of 1696 and his *Solid Philosophy Asserted* of 1697.<sup>4</sup> When historians of philosophy have taken the trouble to pay detailed attention to Sergeant's criticisms, however, it seems to me that they have completely failed to understand his concerns, and have missed what Sergeant was trying to do. Accordingly, these historians have dismissed Sergeant simply as a representative of traditional non-modern ways of thinking, and as a man who was simply incapable of grasping the new 'modern' elements in Locke's philosophy. For John Yolton, for example, the value of Locke's marginal notes to Sergeant's *Solid Philosophy* was in showing that Locke's analysis of knowledge, unlike the traditional scholastic approach of Sergeant, '[...] set the scene for a new approach to these problems [...]; and constituted a [...] landmark in the field of epistemology'.<sup>5</sup> Similarly, Pauline Phemister has seen Sergeant as merely reasserting his allegiance to Aristotle, while Locke '[...] had his eye fixed firmly on the future', and so '[...] their disagreements bear out the classification of Locke as a modern'.<sup>6</sup>

Part of the problem with Yolton's and Phemister's accounts is that they are all too happy to use Sergeant's obvious allegiance to scholastic Aristotelianism as a way of pointing to, and pointing up, Locke's modernism. It never occurs to them to ask *why* Sergeant might still have been defending Aristotelianism in the late 1690s, long after the lessons of Descartes, long after the cumulative impact of the works of the fellows of the Royal Society, and almost a decade after the publication of Newton's *Principia*. Their assumption seems to be that Sergeant's Aristotelianism does not need to be explained: that he is, or was, simply representative of the still lingering influence of Aristotle among minor thinkers.<sup>7</sup>

4 Sergeant John, *The Method to Science* (London, W. Redmayne: 1696); Sergeant John, *Solid Philosophy Asserted against the Fancies of the Ideists: Or, the Method of Science farther Illustrated. With Reflexions on Mr. Locke's Essay Concerning Human Understanding*. (London, Roger Clavil: 1697).

5 Yolton J.W., "Locke's Unpublished Marginal Replies to John Sergeant", *Journal of the History of Ideas* 12 (1951) 528–559, at 559.

6 Phemister P., "Locke and Sergeant on Scientific Method", in Sorell T. (ed.), *The Rise of Modern Philosophy* (Oxford: 1993) 231–249, at 231 and 249.

7 For a better understanding of Sergeant's continued adherence to Aristotle see the best recent study of Sergeant: Levitin D., "Reconsidering John Sergeant's Attacks on Locke's Essay", *Intellectual History Review* 20 (2010) 457–477, especially 471.

In fact, this merely shows that they have not paid sufficient attention to Sergeant's own concerns. If we wish to correct this, as good a starting point as any is to note the fact that Locke's *Essay* (1690) clearly drew Sergeant the controversialist into a new area of dispute. Sergeant's earlier disputes, against the Anglican divines already mentioned, Bramhall, Hammond, Stillingfleet, and so on, were all chiefly concerned with the so-called 'rule of faith' controversy, and so it was a new departure for him to enter into epistemology with his attack on the 'ideism', as he called it, which was represented by both Descartes and Locke.<sup>8</sup> It seems clear, however, that in Sergeant's mind these two areas, the theological rule of faith and epistemology, were not unconnected. Indeed, it was his lifelong concern to establish the truth of the Catholic position on the rule of faith which drew him into his attack on ideist epistemology.

### Who was John Sergeant?

Before looking further into this, it is important to familiarize ourselves, a little at least, with Sergeant himself. Sergeant was a convert to Catholicism. After graduation from St John's College, Cambridge, in 1643, he became secretary to the Bishop of Durham, Thomas Morton (1564–1659), but later in that same year he changed from the Anglican to the Roman communion. In an autobiographical account written in his later years, Sergeant claims that he converted as a result of '[...] searching into the records of antiquity [...]'], whereupon he came to the conclusion that the claims of Catholic tradition were correct. But he also mentions that he was converted by Christopher Davenport (1598–1680), a former student and then colleague of Thomas White's at the English College in Douai. Davenport was the author of *Deus, Natura, Gratia*, an ecumenical work which tried to suggest that there were no significant dogmas separating Anglicans and Catholics. White had written a commendatory preface to the work.<sup>9</sup> It seems very likely, therefore, that Sergeant's first introduction to Catholicism was highly coloured by Blackloism. He then went straight to the English College

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8 I am aware, of course, that I am using the word 'epistemology' anachronistically here—I hope this can be forgiven on the grounds that what I am discussing would now be designated as epistemology.

9 Sergeant John, "The Literary Life of the Reverend John Sergeant", in *Catholicon*, vols. 2 and 3 (London: 1816), vol. III, 10. Franciscus a Sancta Clara [Davenport Christopher], *Deus, Natura, Gratia, sive tractatus de praedestinatione, de meritis et peccatorum remissione, seu de justificatione et denique de sanctorum invocatione* [...] (Lyon, Antonius Chard: 1634). See Dockery J.B., *Christopher Davenport, Friar and Diplomat* (London: 1960).

in Lisbon, where White had been second President of the College (1630–1633), and which could still be regarded as something of a Blackloist forcing house, or if that is too strong, as a college heavily imbued with Jansenist ideas.<sup>10</sup> Sergeant stayed at the college for twelve years before returning to England in 1655. He was immediately appointed Canon of the Chapter, and shortly after became its Secretary, continuing in that post until 1667, by which time, no doubt, his Blackloism made him seem no longer suitable.

There can be no doubt of Sergeant's commitment to the fundamental pillars of Blackloism: unbroken Catholic tradition as the rule of faith, and rigorous Aristotelian rationalism.<sup>11</sup> These two principles are the essential themes of all his published works. But it is much more difficult to be sure of Sergeant's line on the doctrinal details of Blackloism. Sergeant's published works concentrate upon trying to establish the validity, and indeed the infallibility, of tradition as a rule of faith, but he seldom discusses particular aspects of the tradition, such as the doctrine of Purgatory, the immaculate conception of the Virgin Mary, infants receiving the Eucharist, or transubstantiation. It seems safe to assume that he would have been opposed to Papal infallibility, since that does seem to contradict the consensual nature of tradition, but again there is nothing explicit about this in Sergeant's writings. As to the other doctrinal details of Blackloism, however, it is difficult to be sure whether Sergeant fully accepted them.

It is not hard to surmise why Sergeant might have preferred to remain silent about doctrinal details, however. White had already received his first censure from the Holy Office in 1655 when Sergeant first embarked upon his own publishing career. It may simply have been, therefore, that Sergeant knew that he could avoid censure by refusing to descend to what he took to be the detailed doctrinal implications of a close study of early Catholic tradition tightly coupled with a rationalist philosophy. Certainly, if this was a deliberate strategy on Sergeant's part, it worked well. In spite of some threatening machinations by his enemies, Sergeant's works were never censured by his Church. When Peter

10 Blackloism has been seen as an English version of Jansenism. See Duffy E., "The English Secular Clergy and the Counter-Reformation", *Journal of Ecclesiastical History* 34 (1983) 214–230, here 219–222; Bradley R.I., "Blacklo and the Counter-Reformation: An Inquiry into the Strange Death of Catholic England", in Carter C.H. (ed.), *From the Renaissance to the Counter-Reformation: Essays in Honour of Garrett Mattingley* (London: 1966) 348–370, at 359–363; and Tutino, *Thomas White and the Blackloists*.

11 See Southgate B.C., "White's Disciple: John Sergeant and Blackloism", *Recusant History* 24 (1998) 431–436; and Levitin, "Reconsidering John Sergeant's Attacks on Locke's Essay", 460–461 and 464–465. On the main tenets of Blackloism, see Henry, "Atomism and Eschatology".

Talbot, Archbishop of Dublin (1620–1680), tried to have Sergeant censured by publishing an account of his and White's alleged heresies, for example, the case never even reached Rome, having been rejected by a group of doctors at the Sorbonne, to whom the case was first submitted.<sup>12</sup> In a subsequent, unpublished account of Sergeant, Talbot accused him of denying the divinity of Christ, but again this was a charge that, quite rightly, did not stick.<sup>13</sup>

If Sergeant was reluctant to be explicit in his defence of White, contemporaries made no distinction between his beliefs and Blackloism. When Tillotson responded to Sergeant in his *Rule of Faith*, he frequently referred to White's ideas as though they were interchangeable with Sergeant's. Peter Talbot said that Sergeant was always regarded as '[...] the famous Blackloist [...]'; and insisted that the heresy of Blacklo was also '[...] haeresum Sergentii [...]', even if the doctors of the Sorbonne preferred to give Sergeant the benefit of the doubt.<sup>14</sup>

There is little to suggest, however, that Sergeant himself was ever accorded anything like the same kind of respect as White himself. In all my reading I have only discovered four writers who praise Sergeant's abilities: Sergeant himself, and then three twentieth-century historians of English Catholicism: M.V. Hay, George Tavard, and Dorothea Krook.<sup>15</sup> Those eminent divines who took issue with Sergeant, such as Henry Hammond (1605–1660), Edward Stillingfleet

12 Lominus, *Blackloanae Haeresis*. See Krook, *John Sergeant and His Circle* xxi and 163–164; and Hay, *Jesuits and the Popish Plot* 21–29. For Sergeant's own account of his examination by the Sorbonne see Sergeant John, *Raillery Defeated by Calm Reason* (London, D. Brown – A. Roper: 1699).

13 Lominus M. [Talbot Peter], "A Briefe Account of John Sergeant the famous Blackloist his letter threatening to accuse Peter Talbot of treason in case he should publish anything against Sergeant's printed booke wherein he maintains that Christian faith is not divine and by consequence must say that Christ is not God", Bodleian Library, Carte Papers, vol. 38, fol. 734r. See Hay, *Jesuits and the Popish Plot* 183–189, where it is argued that Sergeant did indeed accuse Talbot of treason, implicating him as one of the chief conspirators in the Popish Plot.

14 Tillotson John, *The Rule of Faith. Or an Answer to the Treatise of Mr. I.S. entitled Sure-Footing, &c. 4th edition*; in *The Works of the Most Reverend Dr John Tillotson* (London, H.C.: 1696) e.g. 682, 683, 762; Lominus [Talbot], *Blackloanae Haeresis*; see Krook, *John Sergeant and His Circle* xxi, 165, 166.

15 Hay, *Jesuits and the Popish Plot* 14–16; Krook, *John Sergeant and His Circle*, *passim*. Tavard G.H., *The Seventeenth-Century Tradition: A Study in Recusant Thought* (Leiden: 1978) 219–245. For Sergeant's praise of himself see Hay, *Jesuits and the Popish Plot* 16–18, where he quotes from Sergeant's "Literary Life", published in *Catholicon*, vols. 2 and 3 (London: 1816). See also Southgate, "Beating down Scepticism", where Sergeant is also treated seriously as a philosopher.

(1635–1699), and John Tillotson did not seem to regard him with the esteem accorded to White. On the contrary, they seemed to regard it necessary to answer him only because silence might be taken for acquiescence. Although Locke took the trouble to read through Sergeant's *Method to Science and Solid Philosophy Asserted*, and made substantial marginal comments in both, he evidently never thought it necessary to answer Sergeant in print, or even in a private letter to him.<sup>16</sup> Sergeant seems to have been regarded, therefore, as an irritation, not as a force to be reckoned with. By the time that he died, even if it was '[...] with a pen in his hand [...]', Blackloism had long been a spent force, and Sergeant himself was scarcely regarded.<sup>17</sup>

### The Rule of Faith

Like his mentor, Thomas White, Sergeant was convinced that the Protestant rule of faith in Scripture alone was completely unworkable, and that only the Roman Catholic rule of faith could lead to the true religion.

The unworkability of the Protestant rule of faith is shown, according to Sergeant, by the undeniable fact that there are many different sects of Protestants, who differ on their interpretation of the Bible, and yet who all claim Scripture alone as their rule of faith. The issue is nicely brought out in the first of Sergeant's *Five Catholick Letters* (1687), the letter to Edward Stillingfleet. Sergeant asks Stillingfleet:

In these words of yours (p. 7) [*As to the Rule of our Faith*] give me leave to reflect on the word [*OUR*,] and thence to ask you, Who are YOU? [...] Are you a Socinian, an Arian, a Sabellian, a Eutychian, &c. or what are you? Are you a whole, or a half, or a Quarter-nine-and-thirty-Article man? Do you take them for Snares or Fences, and when for the one and when for the other, and wherefore? These words [*The Rule of OUR Faith*] make you all these at once; for all these profess unanimously Scripture's Letter is their Rule of Faith.<sup>18</sup>

16 See Yolton, "Locke's Unpublished Marginal Replies to John Sergeant"; and Bradish N.C., *John Sergeant, A Forgotten Critic of Descartes and Locke* (Chicago – London: 1929); also published in *The Monist* 39 (1929) 571–628.

17 Dodd Charles, *The Church History of England*, 3 vols. (Brussels [London], s.n.: 1737–1742) I, 472. For a fuller biography of Sergeant see Krook, *John Sergeant and His Circle* 1–11.

18 Sergeant John, *Five Catholick Letters* (London, Mat. Turner: 1688). I have used the first edition of the letter: Sergeant John, *A Letter to the D[ean] of [St.] P[aul's] in Answer to the*



As Sergeant points out a little later, '[...] even the word Protestant too is a Subaltern Genus, and has divers Species, and 'tis doubted by many, who are no Papists, under which Species you are to be rankt'.<sup>19</sup> Sergeant uses the obvious disunity of the Protestant churches, therefore, as a way of showing that Scripture alone, as interpreted by each and every communicant in the 'priesthood of all believers', could only lead to an atomisation of opinion, and could never lead to infallible truth. 'Those Principles of yours', Sergeant wrote to the Dean of St Paul's, 'which you take up for a shew, when you write against Catholics, would, if put in practice, in a short time crumble to Atoms all the Churches in the World[.]'<sup>20</sup>

The Catholic rule of faith, by contrast, did lead to infallible truth, Sergeant claimed. In this he was taking an entirely standard line in Catholic orthodoxy. Divine revelation, according to the Catholic Church, is contained in the written books and the unwritten traditions of the Church which make plain what the written words mean. The Catholic rule of faith is nicely outlined by another leading Blackloist, Sir Kenelm Digby (1603–1665), in his *Conference with a Lady about Choice of Religion* (1638):

The substance of all which may be summed up and reduced to this following short question; namely, whether in the election of the faith whereby you hope to be saved, you will be guided by the unanimous consent of the wisest, the learnedest and the pioussest men of the whole world, that have been instructed in what they believe by men of the like quality living in the age before them, and soe from age to age untill the Apostles and Christ: and that in this manner have derived from that fountayne, both a perfect and full knowledge of all [...].<sup>21</sup>

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*Arguing Part of His First Letter to Mr [Thomas] G[odden]* (London, Henry Hills: 1687) 25. The quotations from Stillingfleet in the quotation are presented as in the original, so the square-bracketed material is in Sergeant's original. See Stillingfleet Edward, *An Answer to Several Late Treatises* (London, R.W.: 1688).

- 19 Stillingfleet, *Answer to Several Late Treatises* 25–26. For more on the dispute between Sergeant and Stillingfleet, and the rule of faith controversy, see Southgate B.C., "The Fighting of Two Cocks on a Dung-Hill: Stillingfleet versus Sergeant", in Coudert A.P – Hutton S. – Popkin R.H. – Weiner G.M. (eds.), *Judaean-Christian Intellectual Culture in the Seventeenth Century* (Dordrecht: 1999) 225–235.

- 20 Sergeant J., *A Letter to the D[ean] of [St] P[aul's]* 27–28.

- 21 Digby Sir Kenelm, *Conference with a Lady about Choice of Religion* (Paris, Widow of J. Blagaert: 1638) 109–110.



The unbroken tradition of the Catholic Church from Christ and the Apostles guarantees the truth of the Roman religion. As Thomas White himself put it, '[...] if we look into the immediate progress and joints of the descent we cannot find where it can misse [...]'.<sup>22</sup>

Now, needless to say, it was easy for Protestants to point to the all too obvious places where Catholic tradition did seem to have gone drastically wrong. It was especially easy given that White had been charged with heresy by his mother Church. As John Tillotson (1630–1694) somewhat facetiously pointed out,

[t]he Pope and Mr White, notwithstanding the plainness of oral Tradition, and the impossibility of being ignorant of it, or mistaking it, have yet been so unhappy as to differ about several points of Faith; insomuch that Mr White is unkindly censured for it at Rome, and perhaps here in England the Pope speeds no better; however, the difference continues so wide, that Mr White hath thought it fit to disobey the summons of his chief Pastor, and like a prudent Man, rather to write against him here out of harms-way, than to venture the infallibility of plain oral Tradition for the Doctrines he maintains against a practical Tradition which they have at Rome of killing Hereticks.<sup>23</sup>

We needn't pursue this argument here. The important thing for our purposes, as should be evident, is that the Catholic rule of faith seems to demand that knowledge is based in consensus, not on the internal mental processes and conclusions of the individual mind. The consensus was not necessarily held to be among the whole, or even the majority; Sergeant was not concerned about the democratic intellect but only about how certain truths could be established. Just as the rule of faith depended upon the apostles who had first heard and spoken with Christ and then the leaders of the Christian community who had heard the Apostles, and the Early Fathers who had heard them, and those who heard the Early Fathers, through to all the Church Councils presided over by successive Popes, so our knowledge of the world depended upon appropriate expert testimony. In the case of logic, for example,

22 White Thomas, *An Answer to the Lord Faulklands Discourse of Infallibility* (London: 1660) 4. This work was written before 1637.

23 Tillotson, *The Rule of Faith* 665–779, 684. White was censured by the Holy Office in 1655, 1657, 1661 and 1663. See Bradley, "Blacklo and the Counter-Reformation" 363.

Terms of Art are made by Men of Art, who are Reflecters, and not directly imprinted by Nature, or Common to all Mankind: For which Reason we must learn the Meaning of those Words, and, consequently, those Notions themselves, from Learned Men, and not from the Generality.

But even in the case of everyday matters of observed fact, '[...] this is call'd Evidence', Sergeant wrote, 'because, tho' it be a Rude knowledge, yet it is a True one; and 'tis the Work of Learned Men to Polish by Art those rough Drafts of Evidence which the Vulgar have by a Natural Way [...]'.<sup>24</sup> What Sergeant seems to have in mind is an everyday equivalent of the famous claim of Thomas Sprat, in his *History of the Royal Society of London* (1667), that when an experiment has been performed by a small group of demonstrators in front of the Society, it is the duty of the Assembly as a whole to judge of the matter of fact demonstrated by this experiment.<sup>25</sup> Learned men are also required, Sergeant insists, to provide definitions of things and of terms of Art, which are '[...] such necessary Instruments to true and solid Science [...]', so much so, in fact, that Sergeant says he '[...] could wish for the Improvement of Knowledge, that our Universities would appoint a Committee of Learned Men to compile a Dictionary of Definitions for the Notions we use in all parts of Philosophy whatever'.<sup>26</sup>

Sergeant recognised that the epistemologies of both Descartes and Locke were in danger of making nonsense of the Roman Catholic concept of infallible knowledge as a consensus of many minds, and it is for that reason that he turned away from explicit discussions of the rule of faith, and entered

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24 Sergeant, *Method to Science* 48.

25 Cf. Sprat Thomas, *The History of the Royal-Society of London for the Improving of Natural Knowledge* (London, T.R.: 1667) Section XVII, 99–100. An anonymous reader took issue at this point with my claim that Sergeant believed that 'knowledge is based in consensus' and asked whether that meant that Sergeant was committed to the claim that 'Whether I know that the sun is shining depends on whether people agree with me'. Presumably Sergeant would want to suggest that when I see the Sun I will be baffled as well as bedazzled by it, unless previously I have been educated to recognize that this dazzling source of light is the Sun. I might have only a folk acquaintance with what the Sun is, or an advanced astronomical knowledge of what it is, either will serve, as will any level of education about the Sun in between these positions. The point is that although I can see the Sun with my own eyes, and need no intercession from anyone else to help me see it, my ability to interpret what it is my eyes are seeing, my *knowledge* of the Sun, is based on a particular level of cultural consensus. For further discussion see the opening paragraph of the section below, headed 'The Notional Way'.

26 Sergeant, *Method to Science*, fol. [d3]r.

into debates about epistemology. It also explains why, as far as Sergeant was concerned, Descartes and Locke could be lumped together as 'ideists', even though from our point of view these two founders of modern philosophy have radically opposed epistemologies. Sergeant was not interested in distinctions between rationalism and empiricism, but only in the fact that both thinkers saw knowledge as the preserve and privilege of the individual, and therefore of the private mind.<sup>27</sup>

It is true, as Yolton and Phemister have pointed out, that Sergeant's response to Locke's empiricist epistemology, the so-called 'notional way', owes a great deal to scholastic Aristotelianism. What's more, many of the original features of the notional way, which cannot be found in Aristotle, are nevertheless attributed to him. It is important to note, however, that this is not simply because Sergeant is a benighted thinker, unaware of recent developments in natural philosophy, and incapable of escaping the Medieval mind-set which saw Aristotle as the master of those who know.

Sergeant was obliged by his commitment to the importance, and the infallibility, of Roman Catholic tradition to continue to uphold Aristotelianism. To reject Aristotelianism would be to reject a major aspect of the tradition of his Church.<sup>28</sup> And besides, continued adherence to Aristotle seemed reasonable on philosophical, not just theological, grounds. After all, philosophy since the Renaissance had been in a more atomised state than Protestant religion, and it was impossible to decide between all the rival philosophical systems merely on rational grounds. As Sergeant pointed out:

Reason being Man's Nature, and the Proper Act of Reason, the Deducing Evidently New Knowledges out of Antecedent ones, it may seem Wonderful that Mankind, after the using their Reason and Disputing so long time, should still Disagree in their Sentiments, and contradict one another in inferring their Conclusions.<sup>29</sup>

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27 Locke is lumped together with the Cartesians, as just another follower of the 'way of ideas' in the Preface of Sergeant's *Solid Philosophy*, especially fol. a2r–a3r. See also Levitin, "Reconsidering John Sergeant's Attacks" 462–464.

28 In this, Sergeant was once again following his mentor, Thomas White. See Henry, "Atomism and Eschatology", and Henry J., "Sir Kenelm Digby, Recusant Philosopher", in Rogers G.A.J. – Sorrell T. – Kraye J. (eds), *Insiders and Outsiders in the Seventeenth Century* (London – New York: 2009) 43–75.

29 Sergeant, *Method to Science* fol. a r.

It seemed necessary once again to revert to the expert testimony of past ages to decide between them. On these grounds, even excluding the Thomistic tradition of the Church and looking simply at the history of philosophy from a secular point of view, Aristotle seemed to carry the day.

### Communitarian Epistemology or Private Thoughts?

I'll come back to a brief account of the Blackloist 'notional way' in philosophy shortly, but first, let me just indicate Sergeant's concern to reject the epistemology of the private mind in favour of a consensual or communitarian epistemology. One of the ways in which this manifests itself in Sergeant's philosophy, as it was to do in the twentieth century following Wittgenstein's *Philosophical Investigations* (but for Sergeant was in keeping with Aristotle's views), is with a concern for 'ordinary language':

Mankind has now for some thousands of years held conversations with one another, yet it was never observ'd that they could not understand one anothers meaning in discourse about Natural Objects; or if any hap'd to occur which was Ambiguous, that they could not make their Notions known by explications; or if there had been some notable variation in their Notions [...] the Mistake can easily be made manifest and corrected by the standard of the Generality of Mankind, who assure them of their Misapprehension; and of Learned Men particularly, who find the Cause of their Mistake [...].<sup>30</sup>

Similarly, a little later in the same work (*Method to Science*):

[...] the only way to acquire solid Knowledge of the Nature of Things, or (which is the same) of those Nature-imprinted Notions, is, not to frame high-flying speculations of them, beaten out of our own Brain, or coin'd by our own Wit: but, to gain by attentive Reflexion, the true and genuine Meaning of those Words, which the Generality of Mankind, or the Vulgar, make use of to signifie those Notions: For, this known, the Meaning of the Word being the Meaning or Notion of those that use it, and their Notion

30 Sergeant, *Method to Science* 7. See also Southgate, "Beating down Scepticism" 300–302. For Wittgenstein's highly influential discussion of 'ordinary language', see Wittgenstein L., *Philosophical Investigations* (Oxford: 1968) §243 ff.

being the Nature of the Thing, it follows, that the Nature of the Thing will be known likewise.

Elsewhere the emphasis is upon how matters of fact, rather than the meaning of terms, are known by collective agreement:

Nay, the best Philosophers (as will be seen hereafter) must learn from their Sayings how to make their Definitions of all such Natural Notions. Thus they know Evidently (tho' Naturally) the force of Witnessing Authority, when 'tis Universal, and of Sensible Matters of Fact: For example, They know there was such a one as Queen Elizabeth, or the Long Civil War in England, for, they know Men could not be deceiv'd themselves in knowing such things, and that they could not All universally conspire to deceive their Children in attesting such a Falshood; or, if they had a mind to it, they know that the Cheat must have been discover'd by some among so many thousands.<sup>31</sup>

But Sergeant also tries the more negative line of denying the validity of the ideist approach with its emphasis upon the solipsistic mind. Descartes's *Ego Cogito*, for example, is dismissed in the *Method to Science* as just another of the many 'Whimseys coyn'd in the Mint of our own Mind', and Descartes's Method brings 'a kind of Enthusiasm into Philosophy'. Indeed, in *Solid Philosophy Asserted* Sergeant reminds his readers that Descartes himself presented three dreams which he had on the night of 10 November 1619 as the 'Foundation' of his method. As far as Sergeant is concerned this simply shows that Descartes was 'stark mad':

Now, Gentlemen, I beseech you, tell me, in good Sober Sadness; Can you think GOD ever intended that the onely Method for Men to get Knowledge, should be to lose their Wits first in looking after it? That to Unman our selves, so as to seem Crack'd-Brain'd, or Drunk, is the Way to become Soberly Rational? That, to reduce ourselves to perfect Ignorance of all that the Goodness of Nature has taught us, (which is, in plain Terms, to make an Ass of one's self) is the onely Certain Way to become a Philosopher?<sup>32</sup>

<sup>31</sup> Sergeant, *Method to Science* 38 and 148.

<sup>32</sup> Sergeant, *Solid Philosophy* Preface, sig. b2v. On Descartes's three dreams, see, for example, Gaukroger S., *Descartes: An Intellectual Biography* (Oxford: 1995) 106–111. Sergeant was not alone among British thinkers in believing Descartes to be mad; see Henry J., "The

Similarly, using Malebranche as a chief representative of the ‘Cartesian Doctrine’, because of his ‘[...] peculiar Talent of talking nonsense as prettily and plausibly as any Man I ever read [...]’; Sergeant points out that, according to Malebranche, ‘[...] all Science [...] comes by Divine Revelation [...]’. But this is tantamount to Enthusiasm:

To what end then are Teachers, Professours, Schools and Universities, if, when we have done what we can by all our Teaching and Learning, nothing but Divine Revelation must do the business, or gain us any Science. But now he advances to a higher point. The Mind (says he) is immediately, and after a very strict manner, United to God [...] by this new Philosophy, every Human Mind is United Essentially to God, that is to the Godhead it self [...]. Was ever such Quakerism heard of among Philosophers! Or, plain honest Human Reason so subtiliz’d and exhal’d into Mystick Theology, by Spiritual Alchemy!<sup>33</sup>

Crazy as all this sounds, Sergeant insists that it is what the ideists proclaim:

Yet, to say True, this is very Consonant to the Doctrine of *Ideas*. They slight the Instruction of Nature, they scorn to be beholding to their Senses, and Outward Objects; which forces them upon *Introversion*, and to observe (as their same Authour [Malebranche] says) what Eternal Truth tells us in the Recesses of our Reason; that is, in their Darling *Ideas*.

The Cartesian Method, he concludes, is nothing more than a ‘piece of Wit’.<sup>34</sup>

Although Sergeant is less polemical in tone in dealing with Locke’s philosophy, he nevertheless sees him as having ‘[...] introduced a kind of Fanaticism into Philosophy [...]’ by his ‘[...] Introversion upon these unsolid Aiery Bubbles [...]’; by which Sergeant means Locke’s ‘[...] Imaginary and Visionary *Ideas* [...]’. If Locke is right, then ‘[...] all Philosophical Knowledge [...] [is] rendred impossible’.<sup>35</sup>

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Reception of Cartesianism”, in Anstey P. (ed.), *The Oxford Handbook of British Philosophy in the Seventeenth Century* (Oxford: 2013) 116–143.

33 Sergeant, *Method to Science* Preface, fol. [d]r–[d]v. On Malebranche, see, for example, Radner D., *Malebranche: A Study of a Cartesian System* (Assen: 1978).

34 Sergeant, *Method to Science* fol. [d]v, and [d4]v.

35 Sergeant, *Solid Philosophy*, Epistle Dedicatory, fol. A4v–A5r.

### The Notional Way

In his article on 'Locke's Unpublished Marginal Replies to John Sergeant', John Yolton seemed to be somewhat baffled by Sergeant's philosophy. He even suggests at one point that '[...] it is hard to understand how Sergeant could have misinterpreted Locke [...]'. In two places he seems to see the crucial difference between him and Locke, but fails to realise its significance. At one point he says that Locke's method of gaining knowledge was '[...] too far removed from the reality of things, too indirect, and too private for Sergeant [...]'; but he does not go on to discuss Sergeant's objections to private knowledge.<sup>36</sup> Again Yolton notices that Sergeant recognizes two ways in which things are invested with 'meaning', and that the second of these is concerned with how meanings are '[...] inherited and passed on or refined through usage [...]'; Yolton even coins a descriptive phrase for this, he calls it the 'ethnological genesis' of meaning. Unfortunately, in the following discussion Yolton focuses on what he takes (mistakenly in my view) to be the first way that things are engendered with meaning, in which meanings are given to the mind directly by external objects.<sup>37</sup>

Putting it simply, Sergeant seeks to replace Lockean Ideas, which as is well known, Locke defined as either sense data or internal mental reflections upon those data, with what he calls 'notions'.<sup>38</sup> Again, stating it simply, notions constitute the mental furniture of our minds, but they themselves are more complex than Lockean ideas because they are mental phenomena based on the interpretation of sense data by our reason in order to fit them into the whole scheme of things of which we are a part, or, in short, in order to give them meaning. Notions, then, are not just things in our minds, but are things in our understanding. Although reason plays a major role, the imposition of meaning onto sense data, in order to turn them into notions in the understanding,

36 Yolton, "Locke's Unpublished Marginal Replies to John Sergeant" 544, 541; see also 539.

37 Yolton, "Locke's Unpublished Marginal Replies to John Sergeant" 549. Perhaps, if Yolton had been writing today, instead of the 'ethnogenesis of meaning', he might have used Martin Kusch's expression 'communitarian epistemology'. See Kusch M., *Knowledge by Agreement: The Programme of Communitarian Epistemology* (Oxford: 2002).

38 Cf. Locke John, *Essay Concerning Human Understanding* (London, Thomas Basset: 1690) II, 1, §2. Needless to say, modern commentators on Locke have argued that there is much more to Locke's philosophy than this two-fold interpretation of the concept 'idea' might initially suggest. See for example, Ayers M.R., *Locke: Epistemology and Ontology* (London: 1991). We do not need to enter into this discussion here, our concern is only with Sergeant's immediate response, which would have been based on Locke's dual definition of idea provided at the opening of Book II of the *Essay*.



would be impossible without a socially acquired repertoire of what Sergeant calls *praecognita* or *praeconcessa*, or things foreknown or foregranted. So, if I receive a particular kind of sense datum, which is strictly speaking nothing more than a rhomboid patch of colour, I can recognise it as a book, if and only if I know what books are. Furthermore, if I know that books are rectangular, to see a rhomboid shape as a book I will also need to have been familiarised with notions of space, distance, perspective distortion, and so on. But this foreknowledge is not innate, according to Sergeant: 'Knowledge may be consider'd as instill'd by insensible degrees into Infants, or the Ruder Sort; or, as Reducible to the Clearest Grounds by Men of Art'.<sup>39</sup> Assuming the acceptability of our notions has been confirmed by our own life experiences, analogous with the general process we considered earlier, in '[...] conversations with one another [...]', and correcting mistakes '[...] by the standard of the Generality of Mankind, [...] and of Learned Men particularly [...]', we can be reasonably confident about the certainty of our knowledge.<sup>40</sup> So, if our notions do conform to the notions of the generality of mankind, then we can be assured of their truth, in much the same way that the doctrines of the faith can be seen to be true because they derive from an unbroken line of teachers from the days of the Apostles themselves, and not because an individual believer has read the Bible for himself in an idiosyncratic way.

If we hope to understand Sergeant, therefore, and the reasons for his radical disagreement with Locke, we must understand the historical context from which his epistemology emerged. At one point in the margin of his copy of Sergeant's *Solid Philosophy* Locke wrote: 'J.S. speaks everywhere as if Truth and Science had personally appeared to him and by word of mouth actually commissioned him to be their sole defender and propagator.'<sup>41</sup> But for Sergeant Truth and Science do not suddenly appear to individual persons—they are acquired by each individual by word of mouth, passed on from generation to generation. Locke's inability to see the point of Sergeant's collectivist epistemology is clearly visible also in a later marginal comment. At the point where Sergeant insists that '[...] it is impossible we can make an Ordinary, much less any Speculative, Discourse, but the Discourers must agree in something that is either Foreknown, or (at least) Foregranted [...]', Locke underlined the word 'discourse'. To the side, Locke wrote: '[...] he means disputants, but Mr. L

39 Sergeant, *Solid Philosophy* 363.

40 Sergeant, *Method to Science* 7.

41 This copy of Sergeant's *Solid Philosophy* is now in the library of St John's College, Cambridge (Classmark: Aa.2.27). This note appears on p. 239. See also Yolton, "Locke's Unpublished Marginal Replies to John Sergeant" 542.



speaks not of disputations but of knowledge'.<sup>42</sup> Sergeant's 'discourse' was not necessarily between disputants, but between teacher and pupil, or expert and layman, parent and child, or indeed any similar social interaction, and his point was that knowledge was acquired through the discourse (which had to be based on something foreknown, such as a common language, fundamental assumptions, etc.). For Locke, however, our knowledge could only be understood as an individual psychological phenomenon, and his conviction blinded him to the clear difference between discourse and disputation; as far as Locke was concerned, if Sergeant spoke of discourse, he could only have meant disputation. Locke believed Sergeant had missed the point—but it was Locke who had missed Sergeant's. As Dmitri Levitin has recently pointed out, Locke responded to Sergeant with '[...] incredulous incomprehension'.<sup>43</sup>

Similarly, when Sergeant objects to the claim of the 'ideists' that clear and distinct ideas can be recognised as a result of '[...] the fresh, fair, and lively appearances they make to the Fancy [...]'; Locke fails to see any merit in Sergeant's alternative. For Sergeant '[...] only the definition, by explicating the true essence of a thing, shews us distinctly the true spiritual notion of it'.<sup>44</sup> Certainty emerges, therefore, from explication, which ultimately allows us to recognise the fundamental nature of the 'notion' in question, and to arrive at an agreed definition of it. But this is by no means an arbitrary process, much less an artificially contrived one: the definitions can only be established by consensus over indefinite periods of discourse. Sergeant is simply trying to indicate how a supposedly 'clear and distinct idea' can in fact derive, *not* from an individual psychological event, but from the force of the collective consciousness imposing it upon all members of the collective. Locke, failing to see any of this, simply alights on the word 'definition': 'Where are those definitions that explicate the true essence of things? And (excepting mathematical) how many of them has J.S.? He would oblige the world by a list of them [...]'.<sup>45</sup> For Sergeant philosophy consisted in '[...] the knowledge of things [...]'; but he saw Locke's version of philosophy as consisting not in knowledge at all (which

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42 Sergeant, *Solid Philosophy* 368–369. Sergeant does mention 'Disputants' a little later, but it is clear he is simply using the word interchangeably with 'Discourers'. Locke's note appears on p. 368 of his copy; see also Yolton, "Locke's Unpublished Marginal Replies to John Sergeant" 544.

43 Levitin, "Reconsidering John Sergeant's Attacks" 476; see also Levitin's footnote 118.

44 Sergeant, *Solid Philosophy* 372.

45 In Sergeant, *Solid Philosophy* 372; see also Yolton, "Locke's Unpublished Marginal Replies to John Sergeant" 545.

must be collectively agreed upon), but merely in internal, private, '[...] perpetual Contemplation of Empty Ideas, or Resemblances'.<sup>46</sup>

Locke was by no means the only thinker to fail to understand Sergeant's 'notional way'. Indeed, it seems fair to say that the mainstream individualistic psychological epistemologies endorsed by Cartesians and British 'empiricists' alike were so dominant that Sergeant's consensualist epistemology was never given serious consideration. This can be seen in the fact that Sergeant's 'notional way' was always summed up, and therefore dismissed, as a ludicrous and unworkable version of individualistic epistemology. We can see this, for example, in a facetious ridiculing of Sergeant's ideas in a *Dialogue between Mr. Merryman and Dr. Chymist* of 1698. Here we see what has become the standard reading of Sergeant's alternative to 'idea', his concept of a 'notion'. Dr Chymist (Sergeant's proponent) is made to say that the notion of a thing '[...] is the very thing itself existing in my understanding [...]'. In case the import of this is missed by the reader, Mr Merryman highlights the absurdity of this:

A Man can call nothing his own that this Man gets a notion of [...] Show him a Gold Watch, a Diamond Ring, a Rope of Pearl, a Purse of Gold, he no sooner gets a Notion of them but whipshins, doxions they are all gone, he has them all in his possession [i.e. they are now, the very things themselves, in his understanding].<sup>47</sup>

Mr Merryman goes on to suggest that it is impossible any thinker could come up with such a ridiculous concept ('Bless me: That 'tis possible for an Old Man to be so ridiculous'), but holds, nonetheless, that this is what Sergeant professed. Merryman was overtly engaged in ridicule, but there is little difference between his interpretation of Sergeant and Locke's.

During Locke's exchange with Edward Stillingfleet, Bishop of Worcester, he pretended to see the bishop's strictures against 'ideas' as leading to what he thought of as Sergeant's 'notional way':

Your Lordship says the Academicks went upon *Ideas*, or *Representations of things to their Minds*; and pray, my Lord, does not your Lordship do so too? Or has Mr. J.S. so won upon your Lordship, by his *solid Philosophy against the Fancies of the Ideists*, that you begin to think him in the right in this too; where he says, *That Notions are the Materials of our Knowledge*; and *that a Notion is the very thing it self Existing in the Understanding*?

<sup>46</sup> Sergeant, *Solid Philosophy*, Preface §2, 11.

<sup>47</sup> T.W., *A Dialogue between Mr. Merriman and Dr. Chymist* (London, s.n.: 1698) 13.

[...] Not thinking your Lordship therefore yet so perfect a Convert of Mr. J.S.'s, that you are perswaded, that as often as you think of your Cathedral Church, or of Des Cartes's Vortices, that the very Cathedral Church at Worcester, or the Motion of those Vortices, it self Exists in your Understanding, when one of them never existed but in that one place at Worcester, and the other never existed any where in *rerum natura*.<sup>48</sup>

The assumption that Sergeant's alternative to an 'idea', the concept of a 'notion', can be summed up as a belief that the things perceived or conceived of actually exist in the mind, still seems to be an accepted view.<sup>49</sup> The only earlier readings of Sergeant (that I am aware of) which consider Sergeant's notion in his own terms, rather than in the light of Locke or Mr Merryman, are those of Norman C. Bradish, the historian of English philosophy, W.R. Sorley, and the more recent commentators on Sergeant, Richard Glauser and Dmitri Levitin. It is worth comparing Sorley's account with that of Mr Merryman and John Locke:

This he [Sergeant] calls 'notion' and a 'notion is the very thing itself existing in the understanding.' He recognized that people will regard this as a paradox, but 'unless this thesis be as true as it is strange, it is impossible any man living should know anything at all.' And therefore he will put the paradox clearly. 'When I say, the glass is in the window, the very glass

48 Locke John, *Mr Locke's Reply to the Right Reverend the Lord Bishop of Worcester's Answer to his Second Letter wherein [...] the Inconsistency of Mr Locke's Notions the Articles of the Christian Faith and their Tendency to Sceptism [sic], is Examined* (London, H.C.: 1699) 294. For studies of Stillingfleet's exchange with Locke, see Stewart M.A., "Stillingfleet and the Way of Ideas", in Stewart M.A. (ed.), *English Philosophy in the Age of Locke* (Oxford: 2000) 245–280; Rogers G.A.J., "Stillingfleet, Locke and the Trinity", in Coudert A.P. – Hutton S. – Popkin R.H. – Weiner G.M. (eds.), *Judaean-Christian Intellectual Culture in the Seventeenth Century* (Dordrecht: 1999) 207–224; Schuurman P., "Vision in God and Thinking Matter: Locke's Epistemological Agnosticism used against Malebranche and Stillingfleet", in Hutton S. – Schuurman P. (eds.), *Studies on Locke: Sources, Contemporaries, and Legacy* (Dordrecht: 2008) 177–193, and Henry J., "Omnipotence and Thinking Matter: John Locke and the Use of Reason in Religion", in Giovannozzi D. – Veneziani M. (eds.), *Materia, Atti del XIII Colloquio Internazionale del Lessico Intellettuale Europeo (Roma, 7–9 gennaio 2010)* (Florence: 2011) 357–379.

49 The anonymous reader I mentioned in note 24 above wrote that I 'totally misunderstood Sergeant's doctrine of notions [...] Sergeant thinks there is a numerical identity between a thing and my thought of that thing.' My point, which the reader seems to have failed to notice, is that that view of Sergeant's concept of 'notion' is an untenable and completely mistaken reading of Sergeant.

itself which is in the window must be also in my mind.' But the paradox is lessened when we find that 'the self-same thing may have both a natural and an intellectual manner of existing.' Things existed in the divine understanding before they were created, and still exist there: and a similar truth holds of the soul which knows anything: it is intellectually that thing. Notion, we might therefore say, is the thing known *qua* intellectual [...].<sup>50</sup>

It cannot be denied that Sergeant's view is obscure, but it is not as immediately untenable as the view attributed to him by Mr Merryman, John Locke, and almost every unfair or inattentive commentator since. Sergeant believes that it is possible for a thing to have a dual existence—a physical existence and an intellectual existence; Richard Glauser refers to this as the 'ontology of double existence'.<sup>51</sup> Sergeant regards the intellectually existing manifestation of a thing as a kind of spiritual entity:

Indeed, our Doctrine, which makes our Notions, Conceptions, or Simple Apprehensions, to be the very Things objectively in our Understanding, seems very Abstruse to those who guide themselves by Fancy, and not by Connexion of Terms; in regard it depends on the Manner of Operating proper to Spiritual Natures; which is above our Common Speculations concerning Natural Subjects [...].<sup>52</sup>

Summarising his *Solid Philosophy against the Fancies of the Ideists*, the work which Locke had traduced in his published exchange with Stillingfleet, Sergeant claimed that one of his chief points was 'the things themselves *spiritually* existing in our understanding as its objects' [my emphasis]. Admittedly, Sergeant's belief that things can exist naturally, or materially, and simultaneously intellectually, or spiritually, is highly obscure; and whether it would repay serious philosophical analysis remains moot. Locke himself simply noted in the margin of his copy of *Solid Philosophy*, 'what is it for a material thing to

50 Sorley W.R., *A History of English Philosophy* (Cambridge: 1920) 125–126. Sorley is referring here to Sergeant's *Solid Philosophy* §3, 27, §18, 35, and §24, 40.

51 Glauser R., "Sergeant, Descartes, and the Way of Ideas", *The Monist* 71 (1988) 585–595.

52 Sergeant John, *Non Ultra: Or a Letter to a Learned Cartesian* (London, A. Roper: 1698) §3. This is included in Bradish N.C., *John Sergeant* (Chicago – London: 1929) 24–61; this quotation at 24–25. Presumably this work was addressed to Antoine le Grand, the leading proponent of Cartesianism in England; see Henry, "The Reception of Cartesianism".

coexist spiritually?<sup>53</sup> Glauser has gone furthest in trying to assess Sergeant's claims. According to Glauser,

[t]his theory of knowledge appeals to an ontology which [...] admits that a reality or a thing can have two different ways of being, one external and formal, the other immanent and objective. Although the cognitive act terminates in the notion, the knowledge of the external object is explained because the notion and the external object are identical, are one and the same thing or reality, despite the difference in their ways of being: 'the difference in the manner of existing prejudices not the identity of the notion and the thing'.<sup>54</sup>

It might be disputed whether, in the passage above, Glauser's quotation from Sergeant's *Solid Philosophy* is valid: can two things be said to be identical if their manner of existence is different? Sergeant defends the claim like this:

It may be replied, that the Notion of a Thing (a Stone, for Example) has a *Spiritual Manner* of Being *in* the Mind; whereas the Thing, or Stone, *out of* the Mind has a *Corporeal Manner* of Being, and therefore 'tis in *some* respect Different from the Thing; and, consequently, not *perfectly* the *same* with it; and so can only be barely *like* it, or resemble it. I answer, 'Tis granted that it is *Unlike it*, and so *Different* from it, and therefore *not the same* with it, as to the *Manner of Existing*; but I deny that either its *Existing*, or *Manner of Existing* do enter into the *Notion*, (except in the Notion of *God*, to whom Existence is Essential,) or do at all belong to it, or the Thing either; but that the Notion is the Thing, precisely according to what is Common to it both *in* the Understanding, and *out of it*, abstractedly from both those *Manners of Existing*.<sup>55</sup>

Again, this remains obscure, but Sergeant is trying to avoid what he sees as a major problem with the way of ideas—namely its sceptical implication that we can never directly know the real world, but only have access to our ideas:

That only is Known, which I have *in* my Knowledge, or *in* my Understanding; [...] Therefore, if I have only the Idea, and not the Thing, in

53 Locke wrote this on p. 59 of Sergeant's *Solid Philosophy*.

54 Glauser, "Sergeant, Descartes, and the Way of Ideas" 589; quoting Sergeant, *Solid Philosophy* 253.

55 Sergeant, *Solid Philosophy* 38.

my Knowledge or Understanding, I can only know the Idea, and not the Thing; and, by Consequence, I know nothing without me, or nothing in Nature.<sup>56</sup>

By implication, Locke's way of ideas puts up a barrier between us and knowledge of the real world:

We cannot possibly know at all the Things themselves by the *Ideas*, unless we know certainly those *Ideas* are Right Resemblances of them. But we can never know (by the Principles of the *Ideists*) that their *Ideas* are Right Resemblances of the Things; therefore we cannot possibly know at all the Things by their Ideas. The Minor is proved thus; We cannot know any *Idea* to be a Right Resemblance of a Thing, (nor, indeed, that any thing whatever resembles another rightly,) unless they be both of them in our Comparing Power; that is, in our Understanding or Reason, and there view'd and compar'd together, that we may see whether the one does rightly resemble the other, or no. But, this necessitates that the Thing it self, as well as the Idea, must be in the Understanding, which is directly contrary to their Principles; therefore by the Principles of the *Ideists*, we cannot possibly know that their *Ideas* are Right Resemblances of the Thing.<sup>57</sup>

Sergeant's 'notional way', therefore, is a kind of direct realism and no doubt suffers from the problems inherent in that view, but it is by no means as foolish as it has been represented by earlier commentators. It is important to reject as completely ill-founded any claims that Sergeant believed Worcester Cathedral would disappear into Edward Stillingfleet's brain as soon as he thought about it; or any comparably crude interpretation of his claim that a thing in itself existed in the understanding. One problem with Sergeant's realism, of course, is how physical or corporeal things give rise to the intellectual or spiritual versions of these things in the mind. One clue to understanding this, perhaps, lies in the analogy with the existence of things in the mind of God, both before and after those things were given physical existence at the Creation (which Sorley drew to our attention above). Using the term 'idea' at one point in his *Letter to a Learned Cartesian*, Sergeant contrasts Locke's ideas, '[...] the Creatures or Productions of your own Mind [...]', with '[...] Ideas in the Divine Understanding; whence are unquestionably Deriv'd, and by which

<sup>56</sup> Ibidem 30.

<sup>57</sup> Ibidem 31–32.

are Establish'd, the Essence of Things.<sup>58</sup> As Dmitri Levitin has pointed out, Sergeant's '[...] ultimate justification for the verity of "notions" lies in theological metaphysics [...];<sup>59</sup> but he was also an empiricist and believed that the senses played a role. It is here, presumably, that his knowledge based on consensual authority entered the picture—our experience of the world does not just come from unmediated sense data but also from discourse, explication, and so forth. Sergeant's 'method to science', borrowed from his 'rule of faith', and insisted that we come to know things through socialization, learning about the consensus view and how and why that came about. So that when we look at a book, what comes into our mind, Sergeant wanted to say, is a book and what a book is, not (as he took Locke to be implying) a mere abstract idea. This is why Sergeant declared that one of the most important lessons of his philosophy was 'That we know the most common notions most easily, and individuals least of all.' This foregrounds his consensual epistemology: what we know best are common notions, the things with which we are all most familiar from our everyday exchanges with others, but we are less confident as individuals about something which only we have seen or experienced, because we cannot call upon general knowledge to confirm our experience.<sup>60</sup> It is significant, but hardly surprising, that this aspect of Sergeant's philosophy, his social epistemology, was never taken up by contemporary philosophers; instead he was simply dismissed as someone who believed, evidently crazily, that things themselves existed in the mind.

### Socio-political Starting Points and Different Kinds of Epistemology

By the 1670s, when Locke began to write the first draft of the *Essay*, religious dissent and factionalism of the kind that had earlier led to the Civil War were increasing once again. According to a note by James Tyrrell, a close friend of Locke's, it was towards the end of 1670 that Locke and a group of friends met to explore questions of '[...] morality and revealed religion[...]'.<sup>61</sup> The pragmatic issue exercising this group of friends was how to unite the dissenting factions;

58 Sergeant, *Non Ultra* § 27 (Bradish, *John Sergeant* 39).

59 Levitin, "Reconsidering John Sergeant's Attacks" 463.

60 Sergeant John, "The Literary Life of the Reverend John Sergeant," quoted from Bradish, *John Sergeant* (Chicago – London: 1929) 11.

61 The origin of the *Essay* in this conversation between friends is mentioned by Locke himself in the 'Epistle to the Reader'. On Tyrrell's indication of the subject matter see Rogers G.A.J., "The Intellectual Setting and Aims of the *Essay*", in Newman L. (ed.),



Locke advocated tolerance of different points of view, on the grounds that the essential fundamentals of the faith are few and agreed by all, and all other details are matters of indifference to one's salvation. As Locke himself wrote in an early manuscript on toleration, there should be a universal right to '[...] pure speculative opinions, as the belief of the Trinity, purgatory, transubstantiation, antipodes, Christ's personal reign on Earth, etc.' because, as they are speculative, they do not threaten the state or the way of life of one's neighbours. Locke went on from here to begin to develop epistemological principles which he saw as supporting the case for tolerance. The first of these principles was what he saw as the compulsion of belief; by which Locke meant that it is impossible for someone to apprehend things otherwise than they appear given his or her beliefs; in just the same way that the eye sees colours in the rainbow, '[...] whether those colours be really there or no [...]'.<sup>62</sup> It followed from this that knowledge, for any given individual, was constituted of those things they were compelled to believe ('whether', Locke might have said, 'they were really true or no'). This requires toleration, Locke believed, rather than trying to change persons' beliefs. Locke's toleration was based on a generally sceptical view that we can never be sure, even in our own case, whether what we believe is really true or not (we cannot transcend the compulsion of our own beliefs). This being so, it is clearly immoral to try to enforce conformity to a belief that cannot be guaranteed to be true. We can add to these preconceptions the more general view among Locke's contemporaries that we cannot know what any given individual really thinks—we all know from our own inner experiences that what someone publicly professes and what they privately believe do not have to coincide. It should be clear that the concern here is with individual thinkers, and their 'private' thoughts. Locke's starting point—the politics of toleration—meant that he developed a theory of the mind, or the understanding, which emphasized its private, seemingly individualistic nature, and its inaccessibility to others.

A number of recent scholars, including John Rogers, Nicholas Jolley, Richard Ashcraft, Neal Wood and Nicholas Wolterstorff, have all argued for the role of Locke's practical concern with religious toleration in Restoration England as

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*The Cambridge Companion to Locke's "Essay Concerning Human Understanding"* (Cambridge: 2007) 7–32, here 8.

62 Locke John, "An Essay Concerning Toleration", in idem, *A Letter Concerning Toleration and Other Writings*, ed. M. Goldie (Indianapolis: 2010) 105–141, here 106. The compulsion of belief was also taken up by Locke's follower, Matthew Tindal. See Levitin, "Reassessing John Sergeant's Attacks" 469.



the starting point from which he developed his epistemology in the *Essay*.<sup>63</sup> We need not pursue the details of this story here. For our purposes, I hope it is clear that, given Locke's starting point, given his concern with the compulsion of belief, and the impossibility of knowing what someone is really thinking, it was almost inevitable that he should develop an epistemology which took it for granted that knowledge, or the presumption of knowledge, is based in the psychology of the individual.

It is easy to see, by contrast, that Sergeant's starting point (essentially seeking to defend the Roman Catholic claims to a monopoly on truth because it is the only Church with a continuous, unbroken tradition handed down from the Apostles, successively to each generation of true believers) led him to insist that epistemology is properly based in the social collective and its consensus.

Locke's assumptions clearly proved to be the most useful for subsequent developments in the history of philosophy, and his *Essay* is regarded as one of the most influential books in Western civilization. It would require another paper to fully explain why this was so, but it should already be obvious, even from the short account given here, that Sergeant's efforts to persuade English contemporaries of the importance of the supposedly unbroken tradition of Roman Catholicism was unlikely to be embraced by the majority of English thinkers. Sergeant, like his fellow Blackloists, always remained outside the mainstream of English philosophy.<sup>64</sup> Locke's *Essay*, by contrast, tuned in not only with political attempts to overcome religious factionalism and introduce a workable system of toleration, but also with the traditional Christian dualism of body and soul, in which the mind, identified with the soul, was as much a private part of the individual as the body (or, given its inaccessibility to others, an even more private part of the person than the body).<sup>65</sup>

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63 Rogers G.A.J., "The Intellectual Setting and Aims of the *Essay*"; Jolley N., "Locke on Faith and Reason", in Newman L. (ed.), *The Cambridge Companion to Locke's "Essay Concerning Human Understanding"* (Cambridge: 2007) 436–455; Wolterstorff N., *John Locke and the Ethics of Belief* (Cambridge: 1996); Wolterstorff N. "Locke's Philosophy of Religion", in Chappell V. (ed.), *The Cambridge Companion to Locke* (Cambridge: 1994) 172–198; and Wood N., *The Politics of Locke's Philosophy: A Social Study of 'An Essay Concerning Human Understanding'* (Berkeley: 1983).

64 On this 'outsider' status, see Henry, "Sir Kenelm Digby, Recusant Philosopher".

65 The split is not between Catholics and Protestants—Descartes's dualism in many respects echoed Christian doctrine that had been introduced by neoplatonizing early Fathers. Sergeant did not dissent from the dualistic view of body and soul; the point is, however, that in seeking to promote the truth of Roman Catholic tradition he chose not to discuss the mind as part of a dualistic entity, but concentrated on the nature of knowledge, and therefore truth. See also Levitin, "Reassessing John Sergeant's Attacks" 475, who draws

Whatever the reasons, there is no denying that the history of epistemology since Locke has effectively been a history of individualistic epistemology. Until very recently, any attempt to regard knowledge as a consensual or communitarian institution has been confined to sociologists who specialize in what is referred to as the sociology of knowledge. There are signs, however, that things are beginning to change. Certain sociologically-inclined interpretations of Wittgenstein's later philosophy have made philosophers pay greater attention to the possibility of a more collectivist epistemology.<sup>66</sup> Even John Searle, once a major representative of the Anglo-American empiricist tradition deriving from Locke, has turned his attention to *The Construction of Social Reality*.<sup>67</sup>

The former chasm between philosophers and sociologists of knowledge shows some signs, therefore, of diminishing (even if it is still a long way from closing). It would be interesting to try to understand why philosophers, after centuries of resistance (or merely indifference), are moving closer towards what Martin Kusch has recently called 'the programme of communitarian epistemology'.<sup>68</sup> Professional philosophers are extremely assiduous in protecting the boundaries of their discipline and have previously excluded sociological approaches to epistemology as beyond the pale. But the traditional, ultimately Lockean, approach to epistemology has been encroached upon in recent decades, first from psychology and more recently from what goes under the name of 'cognitive science'.<sup>69</sup> Philosophers have lost territory in the subsequent re-drawing of disciplinary boundaries, and it is surely not just a coincidence (much less the result of an overwhelming philosophical revelation) that they are now trying to recover lost ground by colonizing the sociology

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attention to similarities between the philosophical theologies of Sergeant and Stillingfleet. Locke, who had a completely different intellectual focus, was happy to discuss human understanding as an aspect of the (individual) mind. For another important discussion of individualistic approaches to the mind, see Shapin S., "The Mind is Its Own Place: Science and Solitude in Seventeenth-Century England", *Science in Context* 4 (1991) 191–218.

66 The main works leading to this socialization of philosophy—all of which take their starting point from Wittgenstein—are Winch P., *The Idea of a Social Science and its Relation to Philosophy* (London: 1958); Kripke S., *Wittgenstein on Rules and Private Language: An Elementary Exposition* (Cambridge, MA: 1982); Bloor D., *Wittgenstein: A Social Theory of Knowledge* (London: 1983); Kusch M., *Knowledge by Agreement*; and Kusch M., *A Sceptical Guide to Meaning and Rules: Defending Kripke's Wittgenstein* (Chesham: 2006).

67 Searle J.R., *The Construction of Social Reality* (London: 1995).

68 Kusch, *Knowledge by Agreement*.

69 Again, Martin Kusch is a good guide here. See, for example, Kusch M., *Psychologism: A Case Study in the Sociology of Philosophical Knowledge* (London: 1995).

of knowledge. It is perhaps only a matter of time before philosophers will lay claim to having always taken account of collectivist, consensual theories of knowledge.

The fact that Locke could not understand the import of Sergeant's claims about the nature of knowledge, however, will provide historical evidence that any such future claim by philosophers would be mere propaganda. Philosophers in the modern tradition have been blind to social epistemology until very recently. Even John Yolton, writing in the 1950s, failed to understand why Sergeant was so opposed to Locke's epistemology; Sergeant's points were as lost on him as they were on Locke. The fact is, our epistemologies, our theories as to what counts as knowledge, and therefore our ideas about what is true, as much as those developed in the early modern period, depend upon our social and political starting points; and if they change, they do so because those broader circumstances have also changed.

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# Eight Days of Darkness in 1600: Hume on Whether Testimony Can Establish Miracles

*Falk Wunderlich*

## Summary

The paper deals with David Hume's views about the status of testimony about miracles, mainly through an analysis of the various cases of miracle reports Hume discusses. I will try to solve the following problems: (a) Hume argues that the probability of miracle reports being true is, in most cases, not only very low but zero, i.e. lower than in any other case of very bad testimony. How can he account for that on an empiricist basis given that a miracle is a violation of the laws of nature, according to Hume, but the laws of nature are based on experience and are not absolutely certain? (b) Why does Hume argue that even miracle reports that are supported by unusually good testimony, i.e. testimony that would suffice to establish what is reported in all other cases, cannot be trusted? (c) Hume argues that if 'all authors, in all languages, agree, that, from the first of January 1600, there was a total darkness over the whole earth for eight days' without the least contradiction, we should indeed 'receive it as certain'. How can this one exception to (b)—that is a case, albeit fictional, where testimony could establish a miracle—be explained? I will argue, following a suggestion by Don Garrett, that testimony *alone* is not enough even under ideal circumstances, but that only small *additional*, non-testimonial evidence is sufficient to render such a miracle report credible.

## Introduction

In recent decades, the epistemology of testimony has become a major philosophical concern.<sup>1</sup> Studying how knowledge is acquired, transmitted, and justified by

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<sup>1</sup> I would like to thank Frank Brosow, Axel Gelfert, and Heiner F. Klemme for various comments on earlier versions of this paper that were immensely helpful, as well as Fritz Thyssen Foundation for the generous support of this project with a Herzog Ernst scholarship in 2010. Hume's first *Enquiry* is quoted according to the Clarendon edition (David Hume, *An Enquiry Concerning Human Understanding*, ed. T. Beauchamp (Oxford: 2000)), followed by section and paragraph.



the reports of others has come to be appreciated more than in the past.<sup>2</sup> In the course of this development, traditional epistemologies centring on the individual have been criticized as incomplete at best. Present-day philosophers have frequently suspected an ideological motivation behind the neglect of testimony.<sup>3</sup> However, this charge does not seem to be entirely fair. Early modern reluctance about testimony has to be evaluated against the background of what testimony was actually supposed to establish at the time: among other things, miracles that were intended to serve as a foundation of religious belief. It is not surprising that this kind of testimony has made Enlightenment thinkers alert and sceptical about the benefits of trusting the reports of others. Hume is of particular interest here since he both offers a theory of testimony in general, appreciating it much more than many of his Enlightenment colleagues, and a critical examination of miracle reports.<sup>4</sup>

The chapter “Of Miracles” in Hume’s *Enquiry Concerning Human Understanding* thus has a long and famous history in the debates on early modern atheism and critique of religion as well as a shorter but no less famous one in connection with contemporary epistemology of testimony. It is puzzling, however, that the very *relationship* between Hume’s theory of testimony in general and that of miracles is seldomly explored in detail, with the recent, remarkable exception of a paper by Axel Gelfert.<sup>5</sup> Gelfert rightly emphasizes

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2 Since the 1990s, an enormous number of contributions to the general testimony debate has been published. To mention but a few of the most significant contributions: Coady C.A.J., *Testimony: A Philosophical Study* (Oxford: 1992); Fricker E., “Telling and Trusting: Reductionism and Anti-Reductionism in the Epistemology of Testimony”, *Mind* 104 (1995) 393–411; Goldman A., *Knowledge in a Social World* (Oxford: 1999); Kusch M., *Knowledge by Agreement: The Programme of Communitarian Epistemology* (Oxford: 2002); Lackey J., *Learning from Words: Testimony as a Source of Knowledge* (Oxford: 2010); Schmitt F. (ed.), *Socializing Epistemology* (Lanham: 1994); Welbourne M., *The Community of Knowledge* (Atlantic Highlands: 1993).

3 C.A.J. Coady, for instance, argues that the ‘neglect of the topic [i.e., testimony] cannot be because of its actual unimportance but it may have been because of a supposed unimportance. In the post-Renaissance Western world the dominance of an individualist ideology has had a lot to do with the feeling that testimony has little or no epistemic importance’. Coady, *Testimony* 13.

4 Hume was far from the only one to discuss the possibility of miracles and of establishing them by testimony; cf. Burns R.M., *The Great Debate on Miracles: From Joseph Glanvill to David Hume* (Lewisburg: 1981) and Earman J., *Hume’s Abject Failure* (Oxford: 2000) (including extracts from various treatments by Hume’s contemporaries), as well as Tom Beauchamp’s remarks in the Clarendon edition of the *Enquiry*, 173.

5 Gelfert A., “Hume on Testimony Revisited”, *Logical Analysis and History of Philosophy* 13 (2010) 60–75. Garrett D., *Cognition and Commitment in Hume’s Philosophy* (New York – Oxford: 1997)



that because Hume's focus is almost entirely on testimony about miracles, his relatively affirmative view of testimony *in general* is obscured.

The first section of this paper is preparatory in character and deals with general issues that are relevant to my concern here but on which I cannot elaborate in more detail: the contemporary debate on reductionism and non-reductionism about testimony (1.1), how Hume is often situated misleadingly in this debate (1.2), and Hume's views on the possibility of miracles as such (1.3). In the main sections 2 and 3, I deal with the status of testimony on miracles and the problems specific to it, mainly by an analysis of the various cases of miracle reports Hume discusses. In doing so, I will try to solve the following problems: (a) Hume argues that the probability of miracle reports being true is, in most cases, not only very low but zero, i.e. lower than in any other case of very bad testimony. How can he account for that on an empiricist basis? Since a miracle is a violation of the laws of nature, according to Hume, but the laws of nature are based on experience and are not absolutely certain, this seems problematic. (b) Why does Hume argue that even miracle reports that are supported by unusually good testimony, i.e. testimony that would suffice to establish what is reported in all other cases, cannot be trusted? (c) Hume argues that if 'all authors, in all languages, agree, that, from the first of January 1600, there was a total darkness over the whole earth for eight days'<sup>6</sup> without the least contradiction, we should indeed 'receive it as certain'. How can this one exception to (b), i.e. a case, albeit fictional, where testimony could establish a miracle, be explained? In my opinion, any explanation of Hume's views on the possibility of miracles and on the possibility of testimony about miracles needs to address this particular problem. I will argue, following a suggestion by Don Garrett, that testimony *alone* is not enough even under ideal circumstances, but that only small *additional*, non-testimonial evidence is sufficient to render such a miracle report credible.

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137–162; Garrett D., "Testimony Concerning Miracles", in Millican P. (ed.), *Reading Hume on Human Understanding* (Oxford: 2002) 301–334 and Millican P., "Twenty Questions about Hume's 'Of Miracles'", in O'Hear A. (ed.), *Philosophy and Religion: Royal Institute of Philosophy Supplement 68* (Cambridge: 2011) 151–192 offer the most comprehensive comments on the miracles chapter. On Hume and the general testimony debate see especially Traiger S., "Humean Testimony", *Pacific Philosophical Quarterly* 74 (1993) 135–149; Traiger S., "Experience and Testimony in Hume's Philosophy", *Episteme* 7/1 (2010) 42–57; Faulkner P., "David Hume's Reductionist Epistemology of Testimony", *Pacific Philosophical Quarterly* 79 (1998) 302–313; Welbourne M., "Is Hume Really a Reductivist?", *Studies in History and Philosophy of Science* 33 (2002) 407–423; Wilson F., "Hume and the Role of Testimony in Knowledge", *Episteme* 7, 1 (2010) 58–78.

6 Hume, *Enquiry* 10.36.

## Reductionism and Non-Reductionism about Testimony

David Hume is one of the few early modern philosophers who have dealt with testimony at some considerable length (though far from the only one, as recent research has emphasized).<sup>7</sup> At the same time, he is usually portrayed as a role model for an overly individualistic approach towards testimony, thus expressing an undue neglect of its importance. At the heart of Hume's conception of testimony there is what has come to be called *reductionism* about testimony. In present-day theories, testimony is considered either a *primary* or a *secondary* source of knowledge and justification. If it is considered a primary source, as non-reductionists claim it is, it enjoys the same status as other sources of knowledge conceived as primary ones—standardly among them perception, memory, and reasoning or inference.<sup>8</sup> If testimony is a secondary one, as reductionists claim, it must be derived from one or more of the primary sources.

More precisely, testimony is for non-reductionists just as basic a source of justification as sense perception, memory, or inference. A responsible hearer has a default entitlement to believe what he is told, as long as he encounters no defeaters, i.e., factors that constitute an argument against believing what the speaker claims in a given case. As long as there is no obvious evidence *against* the speaker's report, the responsible hearer has no *additional epistemic work* to do. He is not obliged to actively seek for such defeaters but only to become alert in case any occur.

According to reductionists, more is needed than the mere absence of defeaters. A responsible hearer must have sufficiently good *positive reasons* for accepting a given report that are not just based on other reports. Thus the situation is different for the hearer, in that additional epistemic work has to be done. Typically, it is held that we obtain the required additional reasons by

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7 Hume and Reid are discussed at length in this regard since they are the standard references for the reductionist and the non-reductionist stances. For historical discussions of other important figures, see Shieber J., "Locke on Testimony: A Reexamination", *History of Philosophy Quarterly* 26, 1 (2009) 21–41; Gelfert A., "Kant on Testimony", *British Journal for the History of Philosophy* 14, 4 (2006) 627–652; Gelfert A., "Kant and the Enlightenment's Contribution to Social Epistemology", *Episteme* 7, 1 (2010) 79–99; Scholz O.R., "Von Rom, den Antipoden und von Wundern: Das Zeugnis anderer in Logiken der Neuzeit", in Spoerhase C. – Werle D. – Wild M. (eds.), *Unsicheres Wissen* (Berlin: 2009) 245–267 (on Joachim Jungius, the Port Royal Logic and Christian August Crusius). For Bacon, Boyle, and English natural philosophy in general, cf. Serjeantson R.W., "Testimony and Proof in Early-Modern England", *Studies in History and Philosophy of Science* 30, 2 (1999) 195–236.

8 There is a notable recent tendency to overcome this divide and elaborate hybrid views, cf., for instance, Lackey, *Learning from Words*.

induction. We observe a general conformity between facts and reports, and, with the aid of memory and reason, we inductively infer that certain speakers, contexts, or types of reports are reliable sources of information.<sup>9</sup>

As mentioned above, Hume most of the time figures as the arch-reductionist in the standard accounts. In these accounts, Hume's Scottish critic Thomas Reid usually figures as the first sustained non-reductionist regarding testimony.<sup>10</sup> According to Reid, we have an *a priori* entitlement to believe what others tell us:

The wise and beneficent Author of Nature, who intended that we should be social creatures, and that we should receive the greatest and most important part of our knowledge by the information of others, hath, for these purposes, implanted in our natures two principles that tally with each other.<sup>11</sup>

The first of these principles is a propensity to speak the truth, and it is complemented by an innate disposition to confide in the veracity of others, and to believe what they tell us. It seems that *if* these two principles were really innate, as Reid argues, things could proceed the way he suggested. Reid also does not simply maintain that these two notable faculties exist but offers a more sophisticated picture. According to Reid, unquestioned trust in testimony is characteristic of the early phases of human life, and this developmental approach is crucial to his theory (as well as to its contemporary equivalents). During these early phases, children 'should be instructed in many things, before they can discover them by their own judgment';<sup>12</sup> self-preservation and advancement (especially language acquisition) are impossible without this basic trust. But 'when our faculties ripen, we find reason to check that propensity to yield to testimony and to authority',<sup>13</sup> and thus, based on what the initial reliance on

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9 The distinction between global and local reductionism plays an important role in the contemporary debate, where it is usually held that only local reductionism is a feasible option. See in particular Fricker, "Telling and Trusting". This distinction does not, however, seem to be relevant to my present concern.

10 Campbell George, *A Dissertation on Miracles* (Edinburgh, for A. Kincaid and J. Bell: 1763) argues against Hume in a similar way in favour of what is now called non-reductionism. See Pitson T., "George Campbell's Critique of Hume on Testimony", *Journal of Scottish Philosophy* 4/1 (2006) 1–15.

11 Reid Thomas, *An Inquiry into the Human Mind on the Principles of Common Sense*, ed. D.R. Brookes (Edinburgh: 1997 [1764]) 193f.

12 Reid Thomas, *Essays on the Intellectual Powers of Man*, ed. D.R. Brookes – K. Haakonssen (Edinburgh: 2002 [1785]) 488.

13 Ibidem.

authority has made possible in the first place, the authority of testimony is questioned in later phases of life. With greater age, the initial *a priori* trust is complemented by experience-based correction mechanisms, and we 'learn to reason about the regard due to them and see it to be a childish weakness to lay more stress upon them than reason justifies'.<sup>14</sup>

### The Received View on Hume on Testimony in General, and His Actual Arguments Reconsidered

Quite a few epistemologists consider Hume to be the paragon of a thoroughgoing reductionism. C.A.J. Coady, for instance, argues that according to Hume, 'we rely upon testimony as a species of evidence *because* each of us observes for himself a constant and regular conjunction between what people report and the way the world is'.<sup>15</sup> Coady sees three main problems with this allegedly Humean view: (1) First-hand evidence is scarce. We do not have as much first-hand evidence at our disposal as is required to establish the conformity between testimony and reality—there is not enough material for enumerative induction for each 'kind of situation' or 'kind of report'.<sup>16</sup> (2) According to the received view, we need enumerative induction by generalizing from past instances *of the same kind*—and the problem is whether it is possible at all to classify instances of testimony into meaningful reference classes. (3) If Hume argues that we cannot observe connections between report and reality *a priori* but only based on the direct, personal experience of a constant conjunction between them, then it must be possible that there are no conjunctions between testimony and reality at all. This, however, is incompatible with the existence of a public language.

The received view has an important implication. Hume's view seems to be that testimony should only be accepted if we are able to check that our informants have been reliable in the past. If we were fully rational agents, we would check every speaker's track record on a sufficient number of instances before feeling justified in believing his or her testimony. But how would an ideal

<sup>14</sup> Ibidem.

<sup>15</sup> Coady, *Testimony* 82. I follow Gelfert's useful summary of the problems involved here (Gelfert, "Hume on Testimony Revisited" 64f.).

<sup>16</sup> For an interesting criticism of the view that Hume necessarily has some kind of *enumerative* induction in mind see Ludwig B., "Zweifeln am Wunder. David Humes 'ewige Schranke' gegen den Wunderglauben", *Zeitschrift für Philosophische Forschung* 55 (2001) 52–79.

hearer accomplish this task? He or she would have to establish the reliability of a speaker by checking each and every report against the facts in the world. Thus if I were an ideal responsible hearer and asked someone something, I would not believe what I am told but instead double-check with a good number of other reports by this person, until I have fulfilled my inductive duties. In other words, I would not literally *reduce* testimony to other sources like immediate perception, but *replace* it. There is after all not much point in asking someone else something I am going to check myself anyway. This holds as long as I have acquired a track record of reliability for that person sufficient to feel justified in believing his or her reports. This would obviously only work for people I deal with over a sufficient period of time, and I would be, as a matter of principle, unjustified in believing what any new acquaintance tells me. This position appears to be utterly absurd if understood literally, and it makes one wonder if Hume was able to seriously pursue it. Gelfert thus rightly notes that there is at least a strong tension between the extreme individualism Coady and others diagnose in Hume and the fact that testimony is, according to Hume, a useful 'species of reasoning',<sup>17</sup> where all he really demands is that no exceptions *in favour* of testimony are made.<sup>18</sup> If testimony is such a useful species of reasoning, then Hume must consider the purported induction possible. But if it is possible, it cannot proceed the way Hume's critics believe.

The chapter "Of Miracles" where Hume's most comprehensive discussion of testimony is located, is divided into two parts, commonly referred to as the '*a priori*' argument based on general conceptual considerations and the second '*a posteriori*' one dealing with a number of specific instances of testimony concerning miracles. Hume first discusses an argument put forward by Archbishop John Tillotson against the Catholic doctrine of the real presence in the Eucharist. According to Tillotson, the authority of the scripture or of tradition here is founded merely on the testimony of the apostles who were eye-witnesses of the miracles Jesus Christ performed. Thus, Tillotson argues, according to Hume, that our evidence 'for the truth of the Christian religion is less than the evidence for the truth of our senses'.<sup>19</sup> The reasons for this are (1) that even in the case of the apostles as eye-witnesses, the evidence of their testimony was not greater than the evidence of their senses; (2) that the

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<sup>17</sup> Hume, *Enquiry* 10.5.

<sup>18</sup> Gelfert, "Hume on Testimony Revisited"; cf. Garrett, "Hume on Testimony concerning Miracles"; Millican, "Twenty Questions"; Traiger, "Experience and Testimony in Hume's Philosophy"; and Welbourne, "Is Hume Really a Reductivist?" for further clarifications concerning Hume's actual arguments.

<sup>19</sup> Hume, *Enquiry* 10.1.

evidence must diminish with the first act of testimony, i.e. in the apostle's communicating the miraculous events to their immediate disciples who were not among the eye-witnesses. It is also held that no one can 'rest such confidence in their testimony, as in the immediate object of his senses'.<sup>20</sup> (3) It is argued that weaker evidence can never destroy stronger, and the evidence of testimony is even in its first instance weaker than the evidence of the senses (and in no case stronger). It follows that (4) giving assent to the doctrine of real presence is 'directly contrary to the rules of just reasoning',<sup>21</sup> because the doctrine contradicts sense, and because the evidence carried by scripture and tradition is weaker (since they are based only on testimony).

These opening remarks seem to support the received view on Hume on testimony: the evidence testimony provides is most of the time inferior to the evidence of the senses and in no case superior; it depends on direct witnessing and delivers the evidence established by that initial act (known as the bucket-chain model in the contemporary epistemology of testimony); thus it can only be a secondary source of knowledge. However, Hume deals with a *specific* instance of testimony here: the testimony reports on which miracles are based.<sup>22</sup> I would like to argue, in accordance with Gelfert, that this context has to be taken seriously, and, as a consequence, we have to carefully distinguish between what Hume argues concerning testimony in general and about miraculous testimony in particular.

Hume, as he puts it, 'flatters himself' to have developed an argument against miracles similar to that of Tillotson. To that end, he first outlines a remarkable *general* theory of testimony, remarkable because it is much more in favour of testimony than one might have expected. Hume claims 'that there is no species of reasoning more common, more useful, and even necessary to human life, than that which is derived from the testimony of men, and the reports of eye-witnesses and spectators'.<sup>23</sup> The fact that we often rely on the testimony of others is not a mistake at all but has a solid basis in observation: 'It will be sufficient to observe, that our assurance in any argument of this kind is derived from no other principle than our observation of the veracity of human testi-

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20 Ibidem.

21 Ibidem.

22 According to orthodox Catholic teaching, transsubstantiation in the eucharist is not a miracle but a mystery known by faith; a miracle would usually be an event that can be observed. It was, however, discussed as a miracle rather than a mystery by some influential figures like Arnauld. See Beauchamp's comment in the Clarendon edition in Hume, *Enquiry* 169f.

23 Hume, *Enquiry* 10.5.

mony, and of the usual conformity of facts to the reports of witnesses.<sup>24</sup> We constantly observe cases of veracious testimony by realizing that reports of witnesses usually conform to the facts attested. Thus, testimony in general is a *reliable* source of knowledge. We do normally have good reasons, according to Hume, to trust the reports of others.

However, for Hume, any claim about the veracity of testimony can only be based on experience. In judging a given report, we should apply the same standards as with regard to all other sources of knowledge. It is central to Hume's theory and 'a general maxim, that no objects have any discoverable connexion together, and that all the inferences, which we can draw from one to another, are founded merely on our experience of their constant and regular conjunction'.<sup>25</sup> There is no reason why testimony should constitute an exception here. If we are unable to establish 'strong connections' anywhere, this cannot be any different with regard to testimony. Hence, the connection between a report and the event reported is about as 'as little necessary as any other'.<sup>26</sup> Testimony is reliable in many instances, according to Hume, but it cannot enjoy the status of an *a priori* justification, as in other competing theories, because there is no such justification for Hume at all, except for connections between ideas in mathematics.

Hume further supports his claim about the general reliability of testimony by addressing three instances of relevant qualities experience discovers in human nature: (1) memory is tenacious to a certain degree: witnesses are not apt to forget what they have witnessed easily, and are therefore able to report it correctly. (2) Human beings commonly have 'an inclination to truth and a principle of probity';<sup>27</sup> this sounds surprisingly similar to Reid's principle of veracity. Even though this common inclination to truth has a different foundation than in Reid (it is based on observations about human nature), it should provide an antidote against the caricatures of Hume's position outlined above. (3) Human beings are vulnerable to shame when convicted of lying; this adds a social aspect to the discussion, that of a social pressure that prevents us from deceit. If we make certain unfavourable observations, however, the usual expectations about the veracity of reports are defeated: 'A man delirious, or noted for falsehood and villany, has no manner of authority with us.'<sup>28</sup> In this case, the standard experience of the veracity of testimony is outweighed by experiences about delirious or deceptive people.

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24 Ibidem.

25 Ibidem.

26 Ibidem.

27 Ibidem.

28 Ibidem.



Hume's analysis of testimony is based on his distinction between three kinds of evidence, demonstration, proof, and probability. Demonstrations concern only relations of ideas and are thus mainly to be found in mathematics. Proof and probability, on the other hand, apply to experience. As the evidence derived from witnesses and testimony is based on past experience, it can either acquire the status of proof or of probability, 'according as the conjunction between any particular kind of report and any kind of object has been found to be constant or variable'.<sup>29</sup> If the connection between a report and an event turns out to be constant, the evidence acquires the status of a proof; if it turns out to be variable, the evidence is merely probable.<sup>30</sup> Thus in cases where past experience turns out to be relatively infallible, we are entitled to expect a report to be reliable with a high degree of certainty and thus consider past experience a full proof. In case we have to proceed with more caution and weigh the evidence for and against an expected event, the report only yields some higher or lower degree of probability. So when our experience turns out not to be uniform, the arguments contradict and mutually destroy each other (as with any other experience). Hume mentions four possible sources of contradiction in the case of testimony: (1) the opposition of contrary testimony (e.g., when witnesses contradict each other), (2) the character and number of witnesses (e.g., if they have a dubious character or an interest in what they affirm; and if they are but few), (3) the manner of their delivering the testimony (e.g., if they deliver their testimony with hesitation or too violent asseverations), (4) the 'union' of sources 1–3.<sup>31</sup> Depending on the force of each of these possible causes of contradiction, the force of a testimony-based argument can be diminished or destroyed. Miracle reports, the kind of testimony Hume primarily discusses in section X of the *Enquiry*, are supposed to function according to this mechanism, as we will also see in what follows.

### The Possibility of Miracles

Before focusing on miraculous testimony I will briefly discuss Hume's concept of a miracle. It is important to recognize, though, that Hume is not primarily concerned with the very possibility of miracles, but rather with whether mira-

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29 Ibidem 10.6.

30 According to Hume '[t]he reason, why we place any credit in witnesses and historians, is not derived from any *connexion*, which we perceive *a priori*, between testimony and reality, but because we are accustomed to find a conformity between them'. Ibidem 10.8.

31 Hume, *Enquiry* 10.8.



cles can be established by reports of witnesses. But this of course presupposes that it is at least clear what a miracle is, according to Hume.

Hume distinguishes miracles from merely *marvellous* and *extraordinary* events. The probability that an extraordinary event will occur is relatively low, and thus, if it is to be established by the reports of others, the degree of assurance this testimony provides must be comparatively high. The hearer weighs the evidence for and against the event in the usual probabilistic fashion. The 'Indian prince' who refuses to believe the first reports of the effects of frost since he was not acquainted with it before can be persuaded only by 'very strong testimony', because frost did not occur within 'those events, of which he had constant and uniform experience'.<sup>32</sup> It can happen that in case of a very unlikely event, no testimony of sufficient strength could be found, as expressed by the Roman proverb '*I should not believe such a story were it told me by Cato*' Hume quotes (EHU 10.9). An event may be so unusual and dissimilar to normal experience that even the authority of Cato is insufficient to outweigh its unlikelyness.<sup>33</sup>

Unlike the merely marvellous and extraordinary, a miracle is, according to Hume, 'a violation of the laws of nature' that has been established by 'a firm and unalterable experience'.<sup>34</sup> By this definition, a miracle cannot occur in the common course of nature but, on the contrary, it has a uniform experience against it, 'otherwise the event would not merit that appellation'.<sup>35</sup> A miracle is

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32 Ibidem 10.10.

33 Ibidem 10.12. The freezing of water is extraordinary for the Indian Prince because it occurs in an instant and thus cannot be explained by analogy to other experiences; hence it is rational for the Prince to not believe in it at first.

34 The distinction between miraculous and marvellous events and the closely connected explanation of natural laws have been debated at length; cf. Garrett, "Hume on Testimony concerning Miracles" 304–306, 319–323.

35 Hume, *Enquiry* 10.12. Interestingly, miracles are also events contrary to the laws of nature for Reid. According to Reid, the physical laws of nature are the rules according to which God usually acts, but they do not restrain his power and do not bring him under the obligation to act in a certain way. Thus 'He has sometimes acted contrary to them, in the case of miracles, and, perhaps, often acts without regard to them, in the ordinary course of his providence. Neither miraculous events, which are contrary to the physical laws of nature, nor such ordinary acts of the Divine administration [...] are impossible' (Reid Thomas, *Essays on the Active Powers of Man*, in *The Works of Thomas Reid*, ed. Sir W. Hamilton (Edinburgh 1846 [1788]) vol. 11, 628) Miracles are thus entirely unproblematic for Reid: God can violate the laws of nature if he so pleases. Although Reid does not discuss testimony on miracles explicitly, it seems obvious that he would not have considered it problematic. If miracles are likely events, there is no reason why they should not be accurately testified.

defined as an event that is contrary to uniform experience, and uniform experience amounts to a full proof, thus 'there is a direct and full *proof*, from the nature of the fact, against the existence of any miracle'.<sup>36</sup> Such a proof could only be outweighed by an opposite proof that is even stronger than the proof against the miracle (this possibility will be discussed in the next section).

There is no doubt that miracles are highly improbable for Hume. But it remains an open question whether he intended to claim that they are completely impossible. In one passage, he seems to say so: against a cloud of believing witnesses, there still stands the 'absolute impossibility or miraculous nature' of certain events.<sup>37</sup> However, as Hume lacks a strong metaphysical notion of natural laws, this dictum constitutes either an exaggeration or an inconsistency. At best, an absolutely impossible event is one discounted by a proof; but by means of experience, Hume cannot strictly exclude the possibility of a stronger proof against it, and a proof is not a demonstration.<sup>38</sup> Moreover, Hume does consider at least one fictional case of a miracle that even could be established by testimony, the darkness-in-1600 miracle at 10.36 in the *Enquiry*. Thus miracles are a theoretical possibility Hume cannot exclude, even though he would argue that no actual miracles have been established yet.

It is important to be aware that Hume adds a second definition of miracles in a footnote that seems to be clearer and narrower than the first one, although it is discussed less frequently in the literature: 'A miracle may be accurately defined, *a transgression of a law of nature by a particular volition of the Deity, or by the interposition of some invisible agent*'.<sup>39</sup> According to the first definition, one might think that any unusual phenomenon not covered by (or contradictory to) the laws of nature that begins to occur regularly at some time would

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36 Hume, *Enquiry* 10.12.

37 Ibidem 10.27.

38 If the impossibility of miracles were proved by a demonstration, they would have to include a contradiction (which Hume never claims they do). Hume's impossibility claim therefore has to be less ambitious; cf. Garrett, "Testimony concerning Miracles" 325f. for a more detailed explanation of how to properly understand the 'absolute impossibility' of miracles in Humean terms. According to Hume's general conceivability criterion of possibility—'whatever we *conceive* is possible, at least in a metaphysical sense' ("An Abstract of a Book Lately Published [...]"; in Hume David, *A Treatise of Human Nature*, ed. D.F. Norton – M.J. Norton (Oxford: 2000) 410)—miracles cannot be impossible in this metaphysical sense since they obviously can be conceived.

39 Hume, *Enquiry* 10.12. I agree with Millican, "Twenty Questions" 167–169 here that this is Hume's *proper* definition of a miracle and not the one from the main text that is usually preferred.

qualify as a miracle. The second definition, however, makes it clear that only phenomena that are *generally irregular* and *erratic* in nature are to be considered miracles. This seems to exclude the following possibility: some strange kind of event that is contrary to the natural laws as we know them could at some point start to occur frequently, thus calling the current laws of nature into question. This could be considered a miracle according to the first, wider definition, but not according to second one. In addition, only phenomena caused by some kind of *invisible agent* can be considered miracles, according to the second definition. It remains unclear, though, whether actions of an invisible agent can be established at all, for Hume—how can there be impressions of such an event?—or whether this is intended to support the absolute impossibility claim; I cannot settle this matter here.

### The Epistemological Status of Miracle Reports

From a Humean standpoint, miracle reports are a problematic form of testimony because the probability that they are true is rather low. However, what Hume actually argues goes beyond low probability: he argues that the probability of miracle reports is zero. It is not easy to see how he can account for this claim by means of the standard analysis he provides. Since the laws of nature are established by experience only, miracles, as violations of these laws, cannot be excluded altogether. Why should the testimony for a miracle be still lower than other kinds of very bad testimony such as marriage rumours (an example Hume discusses in the *Enquiry* at 10.19)? Moreover, Hume argues that some miracle reports are of such a kind that they even constitute an ideal testimony, sufficient to establish an event under normal circumstances, but that they are nonetheless insufficient to establish the miracles they relate. How can such a claim be justified? Does the testimony for miracles constitute an extraordinary, peculiar kind with different standards? If so, why does Hume introduce one contrary example, the fictional darkness-in-1600 miracle, that could be established by testimony?

Previous debates about Hume's views on testimony about miracles have mainly focused on his so-called maxim. His maxim reads:

That no testimony is sufficient to establish a miracle, unless the testimony be of such a kind, that its falsehood would be more miraculous, than the fact, which it endeavours to establish: And even in that case, there is a mutual destruction of arguments, and the superior only gives

us an assurance suitable to that degree of force, which remains, after deducting the inferior.<sup>40</sup>

Thus, if I receive a report about a dead person who has been seen alive, I must reason whether it is more probable that the testifier deceives or is deceived, or that the miraculous event did occur.<sup>41</sup> I reason whether it would be a greater miracle that a testifier deceives or is deceived, or encounters a dead man walking; I weigh the one miracle against the other and always reject the greater miracle, as Hume puts it. It seems that this maxim presents more problems than it solves. It is hard to see how a report being false could ever be so unlikely that it could be considered a miracle, or that a report being false could be against the laws of nature. The truth of propositions has nothing to do with natural laws.

In order to resolve some of these difficulties, I will now take a closer look at the actual miracle reports Hume discusses, and distinguish between cases of miracle reports of the first kind, i.e. those with a low probability, and the few cases of miracle reports with a high probability. But first, I will have a look at the extended list of criteria for reliable testimony Hume lays out at the beginning of the second part, which will serve me as a foundation for the miracle reports Hume discusses afterwards.<sup>42</sup> Hume begins the second part with a more detailed list of criteria reliable testimony has to fulfil and states that, empirically, there is as yet no testimony about a miracle that satisfies them. A testimony about a miracle, just like any other strong testimony, would have to be supported by (1) being attested by a sufficient number of witnesses, where these witnesses (2) be of such unquestioned good sense, education and learning as to secure them against all delusion in themselves, (3) be of such undoubted integrity as to place them beyond suspicion of any motivation for deception, and (4) would have a good reputation to lose if detected in a falsehood. (5) The attesting of the facts would have to be performed in such a public manner and 'in so celebrated a part of the world' that any deception would unavoidably be detected.<sup>43</sup> This is Hume's most comprehensive list of both individual and social factors required for strong testimony that provides the

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40 Hume, *Enquiry* 10.13.

41 Garrett, "Testimony concerning Miracles" 308–311 offers a careful analysis of the kinds of probability Hume deals with and which ones are relevant to miracle reports.

42 As is well known, the first 'a priori' part of the miracles chapter explains how a report could theoretically amount to a full proof of a miracle, whereas the second 'a posteriori' one is intended to show that there never was a case in history where a miracle could actually be established by such a report.

43 Hume, *Enquiry* 10.15.

hearer with 'full assurance' of the attested facts.<sup>44</sup> Testimony satisfying these criteria enjoys a very high probability of being true.

Hume supplements this analysis with a description of an unfavourable psychological mechanism that explains why there is often belief in miracle reports in spite of their insufficient foundation, according to the aforementioned list of criteria. Because of the agreeable passions of surprise and wonder, human beings have, according to Hume, an inclination to believe in such events that often outweighs natural scepticism against unusual happenings. This effect is even increased in the case of religious miracles where 'the spirit of religion join[s] itself to the love of wonder' and causes 'an end of common sense'.<sup>45</sup> Hume lists a number of observations on miracle reports that are, at closer inspection, already contained within the standard criteria at 10.15 in the *Enquiry*:

(a) Miracles are observed, according to Hume, 'chiefly to abound among ignorant and barbarous nations' or to be received from 'ignorant and barbarous ancestors'.<sup>46</sup> This violates criterion (2), according to which the witnesses have to be of good sense, education, and learning, criterion (4), according to which the witnesses must have a good reputation to lose and criterion (5), according to which the miracle has to take place in a 'celebrated part of the world'.

(b) Hume argues that there is no testimony for a miracle that is not opposed by an 'infinite number' of witnesses, with the effect of the testimony destroying itself.<sup>47</sup> Supposedly, the witnesses against a miracle have to be subtracted from those supporting it, in effect violating criterion (1). This also affects religious systems based on miracles and results in the mutual destruction of the evidence put forth for each of them (because 'in matters of religion, whatever is different is contrary').<sup>48</sup> This is an important yet problematic consequence and has been discussed widely,<sup>49</sup> but for the present purpose it suffices that it is covered by (1).

(c) At 10.29 in the *Enquiry*, Hume discusses two psychological factors that can induce a reporter to testify to a miracle: there is a natural inclination to

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44 Ibidem.

45 Ibidem 10.17.

46 Ibidem 10.20.

47 Ibidem 10.24.

48 Ibidem.

49 Hume's critic George Campbell was among the first to argue that Hume's argument collapses because Judaism and Christianity are the only religions founded on miracles and thus the supposed mutual destruction just does not happen (Campbell, *Dissertation* 96).

appear a missionary and prophet and, once converted, a proselyte may even be induced by vanity and heated imagination to lose his scruples in supporting a pious fraud. Both aspects violate criterion (3); the integrity of the witnesses is dubious and they have a strong motivation to deceive. One might also argue that condition (4) is violated since it is doubtful that a proselyte in a state of vanity and heated imagination cares much about his or her good reputation.

In sum, the observations discussed so far contribute to the standard probabilistic analysis of miracle reports outlined at 10.15 in the *Enquiry*. Because miracle reports tend to not satisfy the required conditions, it is highly improbable that they are true. However, this does not mean that it is *totally impossible* that they are true, or that their probability is *zero*. But exactly this is what Hume *also* argues in the second part of the miracles chapter. The problem here is that Hume's empiricist conception of natural laws does not allow him to assume a zero probability of miracles, and he thus allowed for a very low probability in part one. How can he then arrive, by the same means of probabilistic analysis, at the stronger conclusion in the second part?

In order to understand this, I will take a closer look at the five miracle cases discussed by Hume that seem to constitute exceptions. In these cases, the conditions for strong testimony outlined in 10.15 are satisfied, but that still does not render them credible, according to Hume. He discusses three actual examples (Tacitus on Vespasian, Cardinal de Retz, and Abbé Pâris) and two fictitious ones (total darkness over the whole earth for eight days in 1600, and the resurrection of Queen Elizabeth).<sup>50</sup>

i) Tacitus reports miracles by the emperor Vespasian, who allegedly cured a blind man by means of his spittle and a lame man by the touch of his foot. Tacitus is generally conceived as a reliable historian and 'every circumstance seems to add weight to the testimony'.<sup>51</sup> He is 'a contemporary writer, noted for candour and veracity, and withal, the greatest and most penetrating genius', 'so free from every tendency to credulity, that he even lies under the contrary imputation, of atheism and profaneness'.<sup>52</sup> The persons to whose authority he refers as eye-witnesses are equally 'of established character for judgment and veracity', and they give their testimony after the Flavian family to which Vespasian belonged had lost their power, so the eye-witnesses could not expect

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50 Here, I will only give an overview over these reports and turn to a more detailed explanation in section 3.

51 Hume, *Enquiry* 10.25.

52 Ibidem.

any advantage from lying. Last, the emperor Vespasian himself was known for his 'gravity, solidity, age and probity' and refrained from giving himself 'those extraordinary airs of divinity' on other occasions.<sup>53</sup> So, according to Hume's own standards, this testimony is as good as it can get, and 'no evidence can be supposed stronger'.<sup>54</sup> Yet all this does not suffice to establish the supposed miracle (section 3 will explain why this is so).

ii) The case of Cardinal de Retz seems to include an even stronger testimony. Passing through Saragossa, the Cardinal was shown a person who had allegedly recovered a missing leg by rubbing holy oil upon the stump. All circumstances were ideal for reliable testimony: the person who regained his leg was well known in the town, and known by many to be lacking a leg. The Cardinal was a contemporary of the event and, along with numerous other witnesses, had seen the person with two legs. Moreover, the Cardinal had an 'incredulous and libertine' character, as well as 'great genius'.<sup>55</sup> The miracle was of such a kind that it could hardly be forged. Most strikingly, the Cardinal who reported the event did not seem to believe it himself; he thus could not be lying in order to establish the miracle. According to Hume, this 'adds mightily to the force of the evidence'.<sup>56</sup> Even though this conclusion does not seem straightforward and one might argue that it rather diminishes the evidence if a witness declares an event to be unlikely, it is clear that the testimony is very strong; nonetheless, according to Hume, it is still incapable of establishing the miracle. The Cardinal arrived at the same conclusion and argued it was unnecessary to provide a detailed rejection of such a testimony because 'such an evidence carried falsehood upon the very face of it'.<sup>57</sup> Thus, adding to the argument concerning Vespasian, there are certain events so utterly unlikely that no testimony whatsoever is capable of establishing them. Certain content seems to be generally unsuited for testimonial transmission.

iii) The Jansenist Abbé Pâris was well known for numerous alleged miracles (mostly curing of diseases), and, more importantly, many of those miracles were immediately proved 'before judges of unquestioned integrity, attested by witnesses of credit and distinction'. They took place in a 'learned age', and reports of them were published and widely distributed. Moreover, the Jesuits, although staunch opponents of the religious views the miracles supported, were unable to refute or detect any deceit in them. Against such a 'cloud of

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53 Ibidem.

54 Ibidem.

55 Ibidem 10.26.

56 Ibidem 10.30.

57 Ibidem 10.26.



witnesses', there is only one means that provides a sufficient refutation of such reports, according to Hume: 'the absolute impossibility or miraculous nature of the events, which they relate'.<sup>58</sup> In the aforementioned case, the testimony fulfils all requirements and withstands even stronger challenges and hurdles (the attempts of the Jesuits at a refutation, or the sceptical reporter as in the Cardinal de Retz case) and still proves unsuited to establishing the miracle.

iv) Hume argues, remarkably, that, if not used in order to establish a religious system, there *could* perhaps be miracles in the sense of violations of the normal course of nature, and, moreover, that human testimony could establish them.<sup>59</sup> The first imaginary miracle report he discusses is an instance of this possibility. According to this report, all testifiers in all languages and everywhere in the world unanimously relate that there was total darkness over the whole earth for eight days commencing 1 January 1600. The tradition of this event is still strong and lively, and the reports have never been contradicted or even varied by anyone. Apparently, reports of this kind satisfy all the conditions for strong testimony *and* suffice to establish the darkness miracle.

v) The second imaginary miracle testimony reports that Queen Elizabeth died on 1 January 1600 and had been seen by her doctors and the whole court before and after her death. Her successor had been proclaimed by the parliament. After being entombed for a month, she was somehow resurrected, resumed the throne and governed England for another three years. As with the darkness miracle, the testimony is as strong as possible, but contrary to the former, Hume asserts that it is not worthy of belief: 'I must confess that I should be surprized at the concurrence of so many odd circumstances, but should not have the least inclination to believe so miraculous an event.'<sup>60</sup> He would of course not doubt the public events that occurred after Elizabeth's demise, but he would doubt that she actually passed away. Neither the circumstance that it would be extremely difficult to deceive the entire world consistently like this would change his mind, nor the fact that the Queen would not benefit in any way from such a fabricated story—all this would surprise Hume immensely, but he 'would still reply, that the knavery and folly of men are such common phaenomena, that I should rather believe the most extraordinary events to

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<sup>58</sup> Ibidem 10.27.

<sup>59</sup> 'I beg the limitations here made be remarked, when I say, that a miracle can never be proved, so as to be the foundation of a system of religion. For I own, that otherwise, there may possibly be miracles, or violations of the usual course of nature, of such a kind as to admit of proof from human testimony' (Hume, *Enquiry* 10.36).

<sup>60</sup> Hume, *Enquiry* 10.37.



arise from their concurrence, than admit of so signal a violation of the laws of nature'.<sup>61</sup>

### The Problem of Unusual Miracle Reports

It thus appears that not all examples of miracle reports Hume discusses in the second part of section X can be easily ruled out by means of the standard analysis. In some cases, even an ideal testimony proves unsuited to establish an event with adequate probability (let alone a proof).<sup>62</sup> In one case however, the fictional darkness miracle, this did seem just possible: even though we ought to seek for natural explanations, we should accept the reports as true in this case. Thus, Hume has to account for two exceptions: that of the cases where ideal testimony is insufficient, and that of potential cases where miracles could be established nonetheless, which constitute an exception to the first exception. Moreover, Hume's argument that the credibility of any miracle report reduces to zero once applied to establish a religious system requires further discussion. This could be problematic, especially when applied to the darkness miracle. In line with Hume's argument about religious testimony, the probability of the darkness miracle would—once applied to establish a religious system—reduce to zero, even if nothing else changed. It is debatable though whether Hume would want to argue that way, and it certainly would be questionable.

All these deliberations appear to be rather problematic. What is Hume's argument for his claim that a religious application reduces any probability of a report being true (low in most cases but high in a few) to zero? This is the case with the miracles reported by Vespasian, Cardinal de Retz and Abbé Pâris; but why, then, is the Elizabeth miracle implausible even without a religious application? What is the difference between the darkness miracle and the Elizabeth miracle, which are both secular and yet have a different grade of credibility?

In order to clarify these matters in what follows, I will distinguish three questions Hume does not separate strictly: (1) How and why does the usually very small probability of true miracle reports reduce to zero in most cases?

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61 Ibidem 10.37.

62 It is not entirely clear whether a miracle would be considered established if the probability that it occurred is high but does not constitute a proof, or whether a full proof is required in every case. As proof and probability only denote different grades of assurance, I will speak of an established miracle both in the case of high probability and in that of proof.

(2) Why are even those miracles supported by unusually good testimony (thus enjoying a higher probability) unlikely? (3) Why does application of miracle reports in a religious context alone reduce their probability?

### Miracle Reports with a Low Probability

Experience seems to show that miracle reports are unreliable sources of true belief *as a kind*.<sup>63</sup> Almost all miracle reports so far have been invalidated in one way or the other, contributing to the bad track record of the entire genre and compromising it as a kind of report. The consequence is that if we receive a new miracle report, we have no epistemic work left to do, but we are entitled to distrust the report since 'such an evidence carried falsehood upon the very face of it'.<sup>64</sup> Or, as Hume puts it in a letter to Hugh Blair: 'Does a man of sense run after every silly tale of witches or hobgoblins or fairies, and canvass particularly the evidence? I never knew any one, that examined and deliberated about nonsense who did not believe it before the end of his inquiries'.<sup>65</sup> Hume seems to argue that experience has shown that miracle reports, as a kind, are generally not to be trusted and it is thus epistemically rational to not examine them in more detail. Rather, we are supposed to consider alternative explanations of why these reports came about: the dissemination of miracle reports shows the propensity of mankind towards the extraordinary and marvellous,<sup>66</sup> and it is based on the natural principles of credulity and delusion.<sup>67</sup>

If it is true that (a) certain reports can be classified under the common category 'miracle report' and (b) that experience shows that most of these reports have a very low probability, miracle reports are usually false. Contrary to instances of normal testimony where we have an experience-based entitlement to believe what we are told, we have an experience-based entitlement not to believe in what a miracle report relates. One might argue that a kind of report which is typically of a very low probability in this way renders its

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63 One of the problems standardly associated with global reductionism is that it is difficult to class experiences of true or false testimony into suitable kinds, in order to establish track-records for such kinds. In the case of miracle reports this does not, however, seem too problematic: a miracle report is easily identified as a report relating an event that violates the laws of nature.

64 Hume, *Enquiry* 10.26.

65 *The Letters of David Hume*, ed. J.Y.T. Greig (Oxford: 1932), vol. 1, 350.

66 Hume, *Enquiry* 10.16.

67 *Ibidem* 10.31.

probability zero, at least concerning epistemic practice: when confronted with a report about a group of hobgoblins having lunch in the backyard, we are justified to consider it false without further investigation. This amounts to assuming that the event reported has a zero probability in epistemic practice. If the probability of a certain kind of report being true is repeatedly very low, it seems rational to standardly believe that it is false (because a highly improbable event is most likely not going to happen). The life of beings obliged to put a lot of epistemic work into exploring even the smallest eventualities concerning hobgoblin lunches and the like would be very difficult, or at least very different from ours. Moreover, it seems difficult to see how Hume could establish a zero probability of miracles and miracle reports just based on experience.

This mechanism bears some resemblance with the occurrence of undefeated defeaters in non-reductionist theories: according to non-reductionism we are justified to believe in reports until some contrary evidence occurs; we do not have to seek for this kind of contrary evidence actively. With regard to miracle reports, a Humean reductionist could argue that we are justified in believing that these reports are false until some contrary evidence occurs, but we do not have to seek it out.

It should be mentioned here that there could be another strategy to rule out miracle reports with low probability. Miracle reports are always confronted with the strong proof for the laws of nature, and one might argue that such a proof will always crush the already weak evidence of reports with low probability. The argument developed above, however, is easier insofar as it does not even have to take the laws of nature into account (and it does not need Hume's maxim); also, no actual probabilistic reasoning is required (the argument is entirely based on past experience of very low probability of this kind of report). It rather shows how a kind of testimony that regularly exhibits a very low probability literally destroys itself. Probabilistic reasoning alone, on the other hand, could not fully justify our attitude not to even consider possible evidence concerning miracle reports (like in the hobgoblin example), since a very small probability of them being true cannot be ruled out altogether.

### Miracle Reports with a High Probability

Most miracle reports have a very low probability of being true, according to the criteria developed at 10.15 in the *Enquiry*. In the above section, I have suggested how this low probability could reduce to zero in epistemic practice, rendering disbelief the standard attitude. In what follows, I will return to those puzzling cases of reports where the standard analysis yields a higher probability.

According to standard probabilistic analysis, the probability of the miracle reports being true should be significantly higher (or maybe even amount to proof) in the cases of Tacitus on Vespasian, Cardinal de Retz and Abbé Pâris, as well as in the fictitious cases of the eight days of darkness in 1600 and the resurrection of Queen Elizabeth. But, according to Hume, only the reports about the darkness miracle could possibly qualify as being reliable. How to explain this?

At 10.28 in the *Enquiry*, Hume discusses reports about the battles at Pharsalos and Philippi as examples of strong testimony enjoying 'the utmost force and authority'. This force is no natural feature of the testimony as such, but of its unanimity. Had both the followers of Caesar and Pompey claimed the victory in the battle of Pharsalos, it would be *impossible* for us now to decide who was the victor after such a long time. In this scenario the testimony for a victory of Caesar's army would be approximately as strong as the testimony for Pompey's triumph. So there would be a fifty percent probability in favour of Caesar against a fifty percent one in favour of Pompey, and these probabilities neutralize each other and yield a zero probability for both. The question of victory would thus have to remain undecided. Along the same lines, Hume argues at 10.11 in the *Enquiry* that even if the testimony for a miraculous event amounts to a full proof, there is proof against proof where the strongest one prevails, but still with a diminution according to the strength of the other proof. The case Hume discusses now is different only insofar as both proofs have the same strength, and thus the subtraction yields zero.

Hume's arguments concerning the unusually strong miracle reports proceed in a similar fashion. None of the reports passed on so far has amounted to a proof, according to Hume at 10.35 in the *Enquiry*, but even if one of them did, this would not suffice to establish the miracles in question. The reason is the same as in the fictitious case of rival testimony about the victor of the battle of Pharsalos: Such a proof of a miracle would be contradicted by the established proof of the natural laws. The same experience, Hume argues, gives authority to *both* human testimony *and* the laws of nature. When these two kinds of experience are contrary, we 'have nothing to do but subtract the one from the other, and embrace an opinion, either on one side or the other, with that assurance which arises from the remainder'.<sup>68</sup> Apparently, these two proofs neutralize each other even in the best possible case (with fifty percent on each side), and in most cases the authority of the laws of nature would greatly outweigh the authority of testimony because of the usually weak nature of miracle reports. Thus, even the strongest possible testimony for a miracle is contradicted by the equally strong evidence for the laws of nature. Hume's second 'maxim' is

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68 Ibidem 10.35.

based on this; it reads 'no human testimony can have such a force as to prove a miracle, and make it a just foundation for any such system of religion'.<sup>69</sup>

The only remaining puzzle is the fictional darkness-in-1600 miracle. Why does this example constitute an exception, and how does it differ from the Elizabeth miracle?<sup>70</sup> Their important similarity is that they are both free of religious implications. The crucial difference seems to lie in some rather dubious remarks Hume adds to the darkness case. Hume says that decay, corruption and dissolution of nature 'is an event rendered probable by so many analogies, that any phaenomenon, which seems to have a tendency towards that catastrophe, comes within the reach of human testimony, if that testimony be very extensive and uniform'.<sup>71</sup> Now it is true that we experience decay in nature, but in the literal sense of the word only concerning organic life. Moreover, it is unclear why the darkness in 1600 should constitute an instance of decay. It is a one-off event and did not reappear or was not followed by other global signs of decay, nor did it include any further consequences. Decay, on the contrary, is usually a gradual and most of the time irreversible process of dissolution. It may well be that the reason why Hume emphasizes decay here is that in the Elizabeth miracle he discusses immediately afterwards, the reverse of decay occurs, viz. resurrection. Hume might want to argue that decay has been observed within the normal course of nature but never its reverse.

However, if we neglect these internal difficulties, it is relatively clear how the idea of decay fits into Hume's argument. If the eight days of darkness are an instance of natural decay, they can be conceived in *analogy* to another kind of event that occurs within the normal course of nature; analogy itself has been discussed as a kind of probability by Hume.<sup>72</sup> As Don Garrett argues, a proof can be outweighed by another proof if there is *additional evidence* for the latter.<sup>73</sup> This is so especially if additional experiences support the conclusion of one of the proofs by analogy. In the case of the darkness report, the testimony-based proof of the miracle is strengthened by a consideration of resembling experiences of decay in nature. Similarly, R.M. Burns argues that the darkness

69 Ibidem.

70 This problem had already been noticed by George Campbell (*Dissertation* 50–56), for whom Hume here plainly contradicts himself.

71 Hume, *Enquiry* 10.36.

72 Hume, *Treatise* 1.3.12.25 (97); cf. Garrett, "Hume on Testimony about Miracles" 310. Of course, the miraculous event still violates the laws of nature, but it is at the same time compatible with some very general features of natural events, so as to make it at least conceivable.

73 Garrett, "Hume on Testimony About Miracles" 325.

miracle owes its credibility not only to the unusually strong testimony but also to its 'broad similarity to what we already know of the nature of things, though a precise parallel in our prior experience be lacking'.<sup>74</sup> Paul Faulkner, on the other hand, seems to deny that the darkness case is a miracle at all, referring to the narrower definition as a transgression of a law of nature *by a Deity*.<sup>75</sup> Faulkner argues that if a Deity does that, our general supposition that nature is uniform is defeated, and that this kind of event could never be established by testimony (since reliable testimony is based both on the uniformity of nature in general as on the uniformity of human nature). Although this account is compatible with the stricter concept of miracle Hume introduces at 12 in the *Enquiry*, Hume explicitly calls the darkness case a miracle (and not a merely marvellous event) at 10.36 in the *Enquiry*.

But even though the darkness miracle is supported by some analogy within the normal course of nature, it is still a miracle and thus violates the laws of nature as we know them. However, we are not supposed to be content with this outcome. In a scenario like the case of the eight days of darkness, 'our present philosophers' ought to do two things, according to Hume: First, they should not doubt the facts but take the reality of the miracle as a given since it is supported both by strong testimony and by analogies to the common course of nature. Second, though, the philosophers should begin to 'search for the causes, whence it might be derived'.<sup>76</sup> This means that they are supposed to believe in the events reported, but at the same time not to accept them *as miracles* in the sense of irregular occurrences, but to search for their natural causes that are yet unknown. Hence if such events contradict the laws of nature, these laws themselves should be modified accordingly. As the laws of nature are

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74 Burns, *Great Debate* 150. Burns's further discussion of the darkness case is problematic because he seems to argue that it is in fact not really a miracle, but rather an extraordinary event. This is not supported by Hume's text. Burns is right though that we are supposed to seek for natural causes yet unknown and to thereby destroy its status as miracle and integrate into the common course of nature. The extraordinary status of the darkness miracle is also acknowledged by Bailey A. – O'Brien D., *Hume's Enquiry Concerning Human Understanding* (London – New York: 2006) 109–111, as well as by Buckle S., *Hume's Enlightenment Tract* (Oxford 2001) 268, who argues that the essential difference between the darkness miracle and the Elizabeth miracle is the religious character of the latter: religion-grounding miracles owe their significance to the absence of any such analogy to the normal course of nature. Buckle here overlooks that the Elizabeth miracle is secular in nature (and incredible as such), and that its potential religious application would only add a proof of cheat, according to Hume.

75 Faulkner, "David Hume's Reductionist Epistemology of Testimony" 308–309.

76 Hume, *Enquiry* 10.36.

based on experience only for Hume, this is possible without harm. Thus, even if a miracle can be established, the philosophers are required to destroy it *as a miracle* by modifying the laws of nature accordingly.<sup>77</sup>

How does the darkness case sit with Gelfert's account?<sup>78</sup> According to Gelfert, what undermines testimony of miracles is the mismatch between what testimony can do (i.e. serve as a fallible source of probable knowledge) and what the specific content of miraculous testimony demands: certainty that amounts to proof. Testimony can only yield probable knowledge, whereas miracles require proofs. Gelfert's explanation works fine for most of the miracle cases Hume discusses, including those where a strong testimony proves insufficient to establish the miracles. It is true that also in the darkness case, testimony *alone* is not enough to render the event plausible but requires further backing by additional evidence. However, the non-testimonial evidence actually added here was of a rather weak kind: the analogy of eight days of darkness to the decay frequently observed in nature is a very broad one, to say the least, but obviously suffices to establish the miracle in question. Thus it seems that testimony can be strong enough to contribute so much to the credibility of a questionable event that only a little additional, non-testimonial evidence is required, and that it does come at least very close to a proof here.

### Religious Application

Hume puts particular emphasis on religious application of miracle reports. Religious application seems to reduce the credibility of any miracle report even further. The important question for my concern here is whether this is just an instance of the known factors that render a report unreliable, or whether it adds a different one. Regarding the list of criteria for reliable testimony Hume introduced at 10.15 in the *Enquiry*, it is likely that the second (unquestioned good sense), third (undoubted integrity) and fourth (good reputation) criteria would be violated. Hume describes several psychological mechanisms that foster religious belief in spite of weak evidence, such as the passions of

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77 Axel Gelfert has pointed out to me the fact that there is another feature of the darkness miracle that makes it stand out: it is, as it were, a global miracle that is unanimously acknowledged in the whole world, whereas all other miracles are just local occurrences. This certainly contributes to the strength of the testimony reporting this event; however I am not sure whether it would suffice to establish a miracle if there were no additional, non-testimonial evidence.

78 Gelfert, "Hume on Testimony Revisited" 67 f.



surprise and wonder,<sup>79</sup> the propensity of mankind towards the marvellous,<sup>80</sup> the temptation to appear a missionary, human vanity, and heated imagination,<sup>81</sup> which would work against good sense and integrity and possibly also threaten good reputation. The fifth criterion (circumstances where deceptions are easily detected) is clearly violated since, as Hume argues, miracle reports chiefly 'abound among ignorant and barbarious nations'.<sup>82</sup> It thus seems that miracle reports applied to establish a system of religion usually fail according to the standard analysis because their probability is very low. And in the few cases of rather good testimony (Vespasian, Abbé Pâris, and Cardinal de Retz), Hume's second maxim applies according to which the experience-based proof of the laws of nature is still strong enough to outweigh this unusually good testimony.

But religious application seemingly *could* also contribute something of its own. At 10.38 in the *Enquiry*, Hume discusses the possibility that the fictional Elizabeth miracle was used to support a new religious system. According to Hume, the miracle is implausible even without this application and it is first discussed accordingly. But in case of such an application, we would additionally have 'a full proof of cheat', rendering it 'sufficient, with all men of sense, not only to make them reject the fact, but even reject it without farther examination'.<sup>83</sup> So Hume argues that religious miracle reports, in addition to having a zero probability of being true, reveal the reporter's intention of forgery.

### Conclusion

It seems that the crucial case for any interpretation of the miracles chapter is the darkness-in-1600 miracle. This example makes it clear that Hume does consider miracles to be possible at least in theory, that miracles can be established by testimony if supported by additional experiences, and that probabilistic analysis is the sufficient tool to deal with all those miracle reports. Under ideal testimonial circumstances, a miracle report can amount to a proof or at least come close to one, but it would still be neutralized by the contrary proof of the laws of nature; thus even an ideal miracle report as such has a zero probability of being true. This only changes if additional, non-testimonial evidence

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79 Hume, *Enquiry* 10.16.

80 Ibidem 10.20.

81 Ibidem 10.29.

82 Ibidem 10.20.

83 Ibidem 10.38.



in favour of the miracle is provided; however, the requirements for this additional evidence are not very high.

Hume's most important message, however, is that even a miracle that has been established is not supposed to remain one. Rather, we are required to try to integrate such an event into the corpus of natural laws at the cost of modifying or even changing them completely. If this task is performed successfully, though, the miraculous event *loses* its status as a miracle since it does not violate the *modified* corpus of natural laws. Thus, Hume does not accept *any* miracle at all in the end. The purpose of a rational epistemic subject is always, according to Hume, to eliminate miracles, by probabilistic analysis in most cases (in fact in all cases that have occurred so far), but also by modifying the laws of nature if it turned out to be necessary at some stage.

From the perspective of contemporary epistemology, Hume's discussion of miracles can contribute to an awareness of the potential weaknesses of testimony. It seems unlikely that contemporary non-reductionists would be comfortable with allowing miracles such as the ones reported by Tacitus or Cardinal de Retz just because the testimony for them is good enough. But if it seems reasonable to reject them, the question remains how they can be ruled out consistently if we have an *a priori* entitlement to believe what we are told.

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## *Religion and Inquiry*





# Kepler's Revolutionary Astronomy: Theological Unity as a Comprehensive View of the World

Giora Hon

## Summary

It has long been conventional to associate the scientific revolution with Copernicus's *De revolutionibus* (1543). This essay argues in contrast that Kepler's *Astronomia nova* (1609) marks the transformation of science, and especially astronomy, from the ancient and medieval heritage to the modern era. However, Kepler's extraordinary accomplishment has been lost in contradictory historiographies that do not appreciate Kepler's unifying theological approach to astronomy.

It has long been conventional to associate the scientific revolution with the publication of *De revolutionibus* by Nicolaus Copernicus (1473–1543) in 1543.<sup>1</sup> Contrary to this received view, I hold that it is the *Astronomia nova* (1609) of Johannes Kepler (1571–1630) which marks the transformation of science, and especially astronomy, from the ancient and medieval heritage to the modern era. However, Kepler's extraordinary accomplishment has been lost in contradictory historiographies that do not appreciate the unifying theological approach that Kepler had pursued.

Otto Neugebauer, the renowned historian of astronomy, drew an incisive comparison between the old and the new:

There is no better way to convince oneself of the inner coherence of ancient and mediaeval astronomy than to place side by side the *Almagest*, al-Battani's *Opus astronomicum* and Copernicus' *De revolutionibus*. Chapter by chapter, theorem by theorem, table by table, these works run parallel.<sup>2</sup>

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1 Cohen I.B., "The Eighteenth-Century Origins of the Concept of Scientific Revolution", *Journal of the History of Ideas* 37 (1976) 257–288.

2 Neugebauer O., *The Exact Sciences in Antiquity*, 2nd ed (New York: 1969) 205–206.

According to Neugebauer the spell of tradition was broken with the works of Tycho Brahe (1546–1601) and Kepler: ‘The very style in which these men write is totally different from the classical prototype. Never has a more significant title been given to an astronomical work than to Kepler’s book on Mars: “*Astronomia nova*”.’<sup>3</sup> Kepler developed an astronomical theory that departs fundamentally from the systems of Ptolemy and Copernicus; hence its distinctly appropriate title, *Astronomia nova*. A comprehensive grasp of Kepler’s astonishing achievements requires considering theological, conceptual, metaphysical, epistemological, methodological, and rhetorical elements that can be found in his astronomical works. Moreover, one has to regard Kepler not only as a mathematico-physical astronomer, but also as a practising astronomical observer and a designer of instruments.<sup>4</sup>

One of the great innovations of the *Astronomia nova* is its explicit dependence on the science of optics. The declared goal of Kepler in his earlier publication of 1604, *Paralipomena to Witelo whereby The Optical Part of Astronomy is Treated*, was to solve difficulties and expose deceptive visual illusions which astronomers face when conducting astronomical observations with instruments.<sup>5</sup> The variations in illumination, the position, and the motion of the heavenly bodies are all optical issues related to astronomy which Kepler addressed in this book. He sought, as he put it, to ‘lead the optical science through to that degree of subtlety that it might satisfy the astronomer’.<sup>6</sup>

In 1602, Kepler expressed his view concerning the relation between optics and the study of the motion of the planets—that is, astronomy:

I have committed myself to accomplish two goals: the first, to be completed by Easter is the commentary (or whatever its name will be) on the theory of Mars, or the key to a universal astronomy, dealing with [...] problems [...] resulting from Tycho Brahe’s observations. The second, the optical part of astronomy, is to be completed within 8 weeks, and will be of great importance, for what you [Herwart] encouraged me [to do, namely, the investigation of the motion of the planets]. In this work, from

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3 Ibidem 206.

4 Hon G. – Zik Y., “Kepler’s *Optical Part of Astronomy* (1604): Introducing the Ecliptic Instrument”, *Perspectives on Science* 17 (2009) 307–345.

5 Kepler Johannes, *Paralipomena to Witelo whereby the Optical Part of Astronomy is Treated*, trans. W. Donahue (New Mexico: 2000 [1604]); Kepler Johannes, *Johannes Keplers Gesammelte Werke*, ed. W. von Dyck – M. Caspar – F. Hammer – M. List (München: 1937–) vol. II, hereafter cited as *KGW*.

6 Kepler, *Paralipomena* 5.

my observations which are the foundation of computations and hypotheses and from many pieces of information, I collect something general for the consideration of one who wishes to take up a theory of luminous bodies.<sup>7</sup>

In the event it took seven further arduous years to accomplish the first goal, namely, the theory of Mars, and two years to complete the second objective, the optical part of astronomy. It is noteworthy that as early as 1602 Kepler had known that he would be able to conceive a new astronomical theory, and it is equally striking that he first opted to complete his optical studies—a fundamental aspect of his new astronomy. Kepler's *Astronomia nova* combines coherently in a revolutionary way several domains of different kinds of knowledge, which together offer a most powerful system of inquiry.

Why is it then that Kepler's new astronomy has not been recognized as revolutionary? I argue that the diversity and disagreement in the historiographies of Kepler's contributions stood in the way of such recognition. The conflicting views may be reconciled and coherence can be maintained by acknowledging the theological context of Kepler's works and understanding the function of Kepler's own views on theology in the development of his astronomy.

What is the nature of Kepler's new astronomy? In a brilliant rhetorical move, Kepler stated the essence of his astronomy in the title of the book and inserted an insightful comment on the verso of the title page. The full title reads, *New Astronomy Based upon Causes, or Celestial Physics, treated by means of commentaries on the motions of the star Mars from the observations of Tycho Brahe*. And Kepler added, below the dedication to the emperor Rudolph II, *Worked out at Prague in tenacious study lasting many years*.<sup>8</sup> Astronomy is now celestial physics, based on causal arguments, in contrast to the legacy of Ptolemy, which persisted up to the end of the sixteenth century. Moreover, the methodological principle of combining theory with observations is explicitly invoked; an appeal is made to the authority of Tycho Brahe and, finally, Kepler states the thoroughness of the work he conducted.

To ensure that his work would not be misinterpreted in its revolutionary approach, Kepler responded in the verso of the title page to Petrus Ramus (1515–1572), who challenged the astronomical community to develop an astronomy without hypotheses. Kepler first cited Ramus:

7 Kepler in a letter to Herwart, November 12, 1602, in *KGW* vol. XIV, 299–300.

8 Kepler Johannes, *New Astronomy*, trans. W. Donahue (1st ed. 1609; Cambridge: 1992 [1609]) 27; *KGW* vol. III.

the contrivance of hypotheses is absurd; [...] Logic above all, as well as the Mathematical elements of Arithmetic and Geometry, will provide the greatest assistance in establishing the purity and dignity of the most noble art [that is, astronomy]. Would that Copernicus had been more inclined towards this idea of establishing an astronomy without hypothesis! [...] Why could there not rather arise someone from among the great number of celebrated schools of Germany, a philosopher as well as a mathematician who would attain the prize of eternal praise that is publicly offered?<sup>9</sup>

Kepler considered himself, quite rightly, a candidate for Ramus's prize; indeed, he responded to the challenge: 'I have at length succeeded, even by the judgment of your own Logic. As you ask the assistance of Logic and Mathematics for the noblest art, I would only ask you not to exclude the support of Physics, which it can by no means forego.'<sup>10</sup> Kepler thus made it clear that his new astronomy should be understood in physical terms.

In August 1607, in a response to Fabricius—an astronomer who was very critical of this conception of physical astronomy—Kepler explains his position loud and clear.

When you [Fabricius] speak of the components of motions, you speak of something which is only imagination, and which does not exist in reality; for nothing performs the circuits in the sky except the body of the planet itself; [there is] no orb [*nullus orbis*], no epicycle [*nullus epicyclus*]; you, who have been initiated into Tychonian astronomy should know that. Now, if we adhere to the fundamental claim that nothing moves except the body of the planet, the question then arises: what is the path traced out by the circumvolution of this body?<sup>11</sup>

As well as the clear remarks on physical astronomy, it is worth noting the question as to the nature of the path described by the material body of the planet in its motion through space.

Kepler's search for the underlying physical causes of astronomical phenomena was not approved by his teacher, Michael Maestlin (1550–1631). Although he acknowledged Kepler's *a priori* arguments in defense of the Copernican

<sup>9</sup> Ibidem 28.

<sup>10</sup> Ibidem. On astronomy without hypotheses, see Aiton E.J., "Johannes Kepler and the Astronomy without Hypotheses", *Japanese Studies in the History of Science* 14 (1975) 49–71.

<sup>11</sup> KGW vol. XVI, 15.; quoted by Koyré A., *The Astronomical Revolution: Copernicus-Kepler-Borelli*, trans. R.E.W. Maddison (London: 1973) 263.



system,<sup>12</sup> Maestlin expressed his incomprehension of the physical, causal approach and reiterated the traditional view. In a letter to Kepler in September 1616, Maestlin remarked

I believe that physical causes can be dismissed altogether, and that it is fitting to explain astronomical phenomena only through astronomical methods, by means of astronomical, not physical, causes and hypotheses. For calculations demand astronomical bases from geometry and arithmetic, which so to speak represent their wings, rather than physical conjectures, which would more likely confuse than instruct the reader.

In response to this criticism, Kepler asserted that

I shall accept only that which cannot be doubted as truly real, and therefore physical, keeping in mind the nature not of the elements, but of the heavens. If I wholly reject the perfect eccentrics and epicycles, I do so because they are purely geometrical assumptions that do not correspond to any body in the sky.<sup>13</sup>

Kepler indeed claimed that he had transformed 'the whole of astronomy from fictitious circles to natural causes'.<sup>14</sup> Maestlin appears to have been unconvinced by Kepler's new astronomy. The teacher could not grasp the revolutionary thinking of his student.

At the core of Kepler's revolutionary move is the transformation of theoretical astronomy that was understood in terms of orbs, that is, spherical shells to which the planets were attached, and models, called *hypotheses* at the time. Instead, Kepler introduced a single term: orbit (*orbita*); this is the path of a planet in space resulting from the action of physical causes.<sup>15</sup>

12 Barker P., "The Role of Religion in the Lutheran Response to Copernicus", in Ostler M.J. (ed.), *Rethinking the Scientific Revolution* (Cambridge: 2000) 88, n. 61; Methuen C., "Maestlin's Teaching of Copernicus: the Evidence of his University Textbook and Disputations", *Isis* 87 (1996) 230–247.

13 *KGW* vol. XVII, 187–188; quoted by Danilov Y.A. – Smorodinskii Y.A., "Kepler and Modern Physics", in Beer A. – Beer P. (eds), *Kepler, Four Hundred Years. Vistas in Astronomy* 18 (Oxford: 1975) 703; cf. Baumgardt C., *Johannes Kepler: Life and Letters* (London: 1952) 81.

14 Quoted by Aiton, "Johannes Kepler and the Astronomy without Hypotheses" 57.

15 Goldstein B.R. – Hon G., "Kepler's Move from *Orbs* to *Orbits*: Documenting a Revolutionary Scientific Concept", *Perspectives on Science* 13 (2005) 74–111.

In his *Epitome of Copernican Astronomy* of 1618–1621—a book which Kepler wrote with didactic purposes in mind in order to reach a wider audience than that of the *New astronomy*—Kepler provides the following definition:

*What is understood by the name “orbit”?*

Properly speaking, it is that line [i.e., curve] which the planet describes around the sun by means of the centre of its body.<sup>16</sup>

Orbit is a revolutionary concept. It is of profound importance to the development of astronomy and indeed of physics. It is right at the core of the theory that Kepler develops in his new astronomy.

The novelty of this concept cannot be exaggerated. There are dramatic moments in the history of science when the forging of a new concept determines a whole way of thinking with the result that it obliterates the old modes to such an extent that it is almost impossible to retrieve them. Indeed, it takes a great effort of the imagination and a convincing display of evidence to isolate such moments and cast them into relief. Try exercising your imagination by thinking of astronomical theories without appealing to the concept of orbit; you will immediately realize that it is almost impossible to do so. This is the mark of Kepler’s revolutionary move. The concept of orbit transformed the goal of astronomy from finding geometrical models that can account for planetary motion to finding the forces that can account for the path of a planet. Here is a concept that radically transformed an entire discipline.

In Ptolemy’s *Almagest* the principal goal is to produce geometrical models to account for the motion of the planets from which two coordinates, celestial longitude and celestial latitude, could be computed for any given time. The subjects treated in the *Almagest* served to define an astronomy in which there is no appeal to physical causes, and this approach is still evident in the sixteenth century in the works of (among others) Copernicus and Tycho Brahe. During this long period Ptolemy’s models for planetary motion were modified with respect to both their geometry and the relevant parameters, leading to the construction of new astronomical tables. But the conceptual framework remained essentially unchanged. In another work, *The Planetary Hypotheses*, Ptolemy built on the models in the *Almagest* to produce a cosmological scheme which was not seriously questioned before Copernicus. The early chapters in *De revolutionibus* are devoted to both astronomical and cosmological issues,

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16 Kepler Johannes, *Epitome of Copernican Astronomy*, in *The Great Books of the Western World*, vol. 16: *Ptolemy, Copernicus, Kepler*, ed. R.M. Hutchins, trans. C.G. Wallis (Chicago: 1952 [1618–1621]) 999; *KGW* vol. VII, 394.

but thereafter the entire discussion is astronomical and each planet is treated separately.

In Copernicus's cosmological scheme the (mean) sun is the centre of motion (rather than the Earth), and the planets are now ordered by their periodic returns about the sun. To be sure, the cosmological schemes of Ptolemy and Copernicus are not interchangeable, for they imply different sets of planetary distances as well as different centres of motion. However, in both Ptolemaic and Copernican cosmology the reality of planetary orbs, that is, material spherical shells, was assumed; each orb moved and the planet attached to it shared its motion (with no motion of the planet relative to its orb). These cosmologies were undermined by Tycho Brahe's proof near the end of the sixteenth century that material solid orbs do not exist. Clearly, planets could not be attached to non-existing orbs, and this raised two questions: what prevents them from falling? And how do planets move?

Kepler's radical response was to incorporate cosmology into a new astronomy based on causes. The new conception is that planets are moved by forces in space, tracing an orbit (or trajectory) in three dimensions: celestial longitude, celestial latitude, and distance from the centre of motion. As noted, the first two coordinates had always been part of astronomy, while the third element—distance—had been part of cosmology. For Kepler the concept of distance took priority over time and motion:

Distance from the centre is prior both in thought and in nature to motion over an interval [of time]. [...] [For] distance from the centre can be conceived without motion. Therefore, distance will be the cause of intensity of motion, and a greater or lesser distance will result in a greater or lesser amount of time.<sup>17</sup>

Nothing like this was said by earlier astronomers.

In rendering astronomy physical, which implies a coordinate system in three dimensions for planetary motion, Kepler redefined the practice of astronomy. The task of the astronomer was no longer to find geometrical models to account for planetary motion; rather, it was to identify physical forces governed by laws of nature, which determine the orbit of a planet in space. Hence the critical role of the solar force which extends in this new astronomy throughout space.

But how was Kepler's revolutionary astronomy understood? And why has the 'Copernican revolution' become in the annals of history of science, indeed,

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<sup>17</sup> Kepler, *New Astronomy* 377.

in the history of ideas, a crucial step in ushering in the modern world, while we do not hear of the 'Keplerian revolution'?

Essentially, two historiographical traditions can be discerned in Kepler studies.<sup>18</sup> One tradition of historiography—the earliest one—crystallized mainly around a nucleus of scientists who were active in the Paris Academy during the last half of the eighteenth century and the early part of the nineteenth. Much influenced by French Encyclopaedic philosophy, they sought to demonstrate the orderly progress of the human mind and to furnish the practising scientist with a useful repository of ideas, methods, and theorems. Thus, they tended to expound and explicate only the technical part of Kepler's work. This tradition culminated in Delambre's *History of Modern Astronomy* of 1821 in which some 300 valuable pages are devoted to the mathematical and empirical aspects of Kepler's scientific work.<sup>19</sup> This early technical tradition, as Westman points out, 'shed much light on Kepler as an ingenious astronomer, the discoverer of new techniques and of new laws of nature. But', Westman continues, 'it was frequently embarrassed—"surprised and distressed" are Delambre's words—at the mystical, metaphysical reasoning that inexorably permeated the writings of the Great Man'.<sup>20</sup>

This approach tends to perceive two 'Keplers': on the one hand, Kepler the discoverer of the so-called empirical laws of planetary motion and, on the other, Kepler the religiously inspired mystic whose metaphysics can safely be dismissed in the words of Laplace as 'chimerical speculation'.<sup>21</sup>

Consider, for example, Berry's *Short History of Astronomy* of 1898; upon evaluating Kepler's work he writes that the scientific works of Kepler

fill but a small part of [his ...] voluminous writings, which are encumbered with masses of wild speculation, of mystic and occult fancies, of astrology, weather prophecies, and the like, which are not only worthless from the standpoint of modern astronomy, but which—unlike many erroneous or imperfect speculations—in no way pointed towards

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18 Westman R.S., "Continuities in Kepler Scholarship: The European Kepler Symposia in Historiographical Perspective", in Beer – Beer (eds.), *Kepler, Four Hundred Years* (Oxford: 1975) 58–63.

19 Delambre J.B., *Histoire de l'astronomie moderne* (Paris: 1821) vol. 1, 314–615.

20 Westman, "Continuities in Kepler Scholarship" 59.

21 Laplace P.S., *Exposition du système du monde*, 5th ed. (Paris: 1824 [1796]) 361; Westman, "Continuities in Kepler Scholarship" 60, n.21; Aiton E.J., "Johannes Kepler in the Light of Recent Research", *History of Science* 14 (1976) 77; for a general discussion, see Brooke J.H., *Science and Religion: Some Historical Perspectives* (Cambridge: 1991).

the direction in which the science was next to make progress, and must have appeared almost as unsound to sober-minded contemporaries like Galileo as to us.

And Berry concludes that 'if Kepler had burnt three-quarters of what he printed, we should in all probability have formed a higher opinion of his intellectual grasp'.<sup>22</sup> This position, if somewhat less strongly expressed, has never lost ground.

In reaction to this tradition, Westman explains, there developed a second historiographical trend: 'it focused attention away from the explication of Kepler's astronomical techniques *qua* techniques and, instead, demanded an investigation of the philosophical foundations of his discoveries'.<sup>23</sup> It was Whewell who first articulated this viewpoint, claiming that 'in making many conjectures, which on trial proved erroneous, Kepler was no more fanciful or unphilosophical than other discoverers have been'.<sup>24</sup> But the most influential analysis of Kepler's writings within this approach is due to Cassirer who, in *The Problem of Knowledge* of 1906, ushered in a new era of Kepler studies, and indeed established the second historiographical approach.

Underlying Cassirer's analysis is the Kantian claim that reality, as the object of experience, cannot be reached like, for example, the ideal entities of Plato. Reality, as it is perceived, is rather conditioned by certain intuitive functions of the mind. Thus, as Cassirer puts it, the concepts of science are 'symbols of the ordering and connecting functions which present the inner nature of the concrete' to the mind.<sup>25</sup> For Cassirer, therefore, progress in science is not a cumulative process but rather a reflection of the creative features of the mind in shaping and impressing, in each epoch, its own conceptions on reality.

A recurring issue in Kantian philosophy is the problem of unity. The process of attaining knowledge involves, for Kant, the faculties of sensuous intuition, imagination, and understanding, which are combined in the unity of the subjective consciousness. Hence, it is no wonder that Cassirer, by extension, examined Kepler's work from the standpoint of the concept of unity. Indeed, as Westman points out, 'Cassirer's main achievement [...] was to demonstrate

22 Berry A., *A Short History of Astronomy* (New York: 1961 [1898]) 197.

23 Westman, "Continuities in Kepler Scholarship" 59.

24 Whewell W., *History of the Inductive Sciences*, 3rd ed. (London: 1857) vol. 1, 318; quoted by Westman, "Continuities in Kepler Scholarship" 60.

25 Cassirer E., *Das Erkenntnisproblem in der Philosophie und Wissenschaft der neueren Zeit* (Berlin: 1906) vol. 1, 19; quoted by Westman, "Continuities in Kepler Scholarship" 61–62.

the remarkable unitary nature of Kepler's thought'.<sup>26</sup> The concept of harmony, for example, which is so prevalent in Kepler's writings, is taken in Cassirer's analysis to be an instrument of the mind which can lay bare the coherence that underlies the seemingly chaotic nature of matter.<sup>27</sup>

However, Kepler is widely removed historically from Kantian critical idealism, and his belief in the existence of physical reality and the human ability to comprehend it does not match the kind of reality Kant's idea of knowledge professes to attain. But this claim is not here at stake; what is important to note is the fact that by introducing the notion of unity into Keplerian studies, Cassirer made some headway in the direction of resolving the existence of several 'Keplers' who all lived through the turbulent years between 1571 and 1630. (The Thirty Years' War took place between 1618 and 1648.) Kepler has been described and characterized as a Platonist, Neo-Platonist, Pythagorean, Aristotelian, Occultist, Mystic and the like, and it was the pioneering work of Cassirer which attempted to reconcile all these strands and to present Kepler as a coherent thinker.

The introduction of the concept of unity did not however take firm root in the studies of Kepler. Consider for example Sarton's view; in his opinion, Kepler 'lived to his last day in a mist of occultism', and his writings, to use Sarton's own words, 'are almost repulsive by their prolixity, obscurity and mysticism. They contain some treasures of inestimable value,' Sarton admits, but continues to ask, 'who will have the courage to look for them in the enormous mass of verbiage wherein Kepler chose to bury them?'<sup>28</sup> And the renowned British astronomer, Eddington, concurred when—speaking on the tercentenary of Kepler's death at the Kepler monument in Weil der Stadt, Kepler's birthplace—he expressed the view that Kepler was a strange erratic genius whose half fantastic way of thinking, capable of preposterous misjudgment, was scarcely such as one should extol as an example to be generally imitated.<sup>29</sup>

Holton, to take another example, notes the incongruous elements which in his view comprise Kepler's work: 'physics and metaphysics, astronomy and astrology, geometry and theology'. Holton then sets himself the task, as he puts it, of identifying 'those disparate elements and to show that in fact much of Kepler's strength stems from their juxtaposition.' Thus, when Kepler's 'physics

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26 Westman, "Continuities in Kepler Scholarship" 62.

27 Ibidem.

28 Sarton G., "A Review of *J. Kepler's Die Zusammenklänge der Welten...*, von Otto J. Bryk", *Isis* 4 (1922) 512–513.

29 Eddington A.S., "Speech at the Kepler Monument in Weil-der-Stadt", *Die Naturwissenschaften* 18 (1930) 941.

fails, his metaphysics comes to the rescue; when a mechanical model breaks down as a tool of explanation, a mathematical model takes over; and at its boundary in turn stands a theological axiom.<sup>30</sup> This explains, Holton believes, Kepler's ability to employ interchangeably a universal physical force, a unifying image of the central Sun, and a unifying principle of all-pervading mathematical harmonies. Although Holton concedes that mathematics, physics and metaphysics are in fact inseparable—at least in the case of Kepler's belief in the central role of the Sun<sup>31</sup>—he does portray, nevertheless, a Kepler who vacillates between mathematics, physics and metaphysics; an approach which has engendered, according to Holton, three different kinds of universe: the universe of mathematical harmony, the universe of physical machine, and the universe as central theological order.<sup>32</sup>

However, much more disturbing than Holton's view of incongruous elements in Kepler's work are the many 'Keplers' that Koyré has created in his various studies. There one can find Kepler the revolutionary thinker versus Kepler who is bound by the Aristotelian tradition;<sup>33</sup> Kepler the great scientist versus Kepler the poor philosopher;<sup>34</sup> and there is even Kepler the geometer versus Kepler the physicist.<sup>35</sup> Koyré's attempt—in his book of 1961, *The Astronomical Revolution: Copernicus-Kepler-Borelli*—to bring together the two historiographical traditions of Kepler studies is admirable, but however scholarly and informative the book may be it has failed to bring to the fore the concept which I claim is crucial to the understanding of Kepler's work, namely, the concept of unity, and theological unity at that.

In the spirit of the Renaissance, and following the works of Nicholas of Cusa (1401–1464) and Pico della Mirandola (1463–1494) in particular, Kepler attempted to achieve unity of knowledge by reconciling the various contemporaneous philosophies, and to attain thereby what Pico had called *pax philosophica*.<sup>36</sup> Pico's plan to execute a work under the title *Symphonia Platonis*

30 Holton G., "Johannes Kepler's Universe: Its Physics and Metaphysics" in Holton G., *Thematic Origins of Scientific Thought: Kepler to Einstein* (Cambridge: 1975) 69–70.

31 Ibidem 81.

32 Ibidem 76–78, 86.

33 Koyré A., *From the Closed World to the Infinite Universe* (London: 1974) 87.

34 Koyré A., *Galileo Studies*, trans. J. Mepham (Hassocks: 1978) 144; see also 146.

35 Koyré, *The Astronomical Revolution* 271.

36 Dulles A., *Princeps Concordiae, Pico della Mirandola and the Scholastic Tradition* (Cambridge: 1941) XI, 53, 58, 103, 132–134; Cassirer E., "Giovanni Pico della Mirandola", *Journal of the History of Ideas* 3 (1942) 126; Garin E., *Portraits from the Quattrocento* (New York: 1972) 202, 207. The concept of unity and its possible attainment constitute two recurring themes in Pico: see Pico della Mirandola, *Oration on the Dignity of Man*, in



*et Aristotelis*, of which nothing has been preserved, was in a sense carried out by Kepler. Abstract forms, of which, in Plato's doctrine, knowledge can be had, do not exist in separation from their manifestations in the concrete world, namely, the particulars, which Aristotle addresses. The perception of form and matter as unity is an essential element in Kepler's natural philosophy.

In 1608, Kepler writes in a letter to Fabricius that he is 'deeply interweaving and entwining Copernicus' theory with a revised astronomy and physics so that either both will perish together or both will survive'.<sup>37</sup> However, as Lindberg points out,

historians of Johannes Kepler's astronomy and cosmology have ceased to be embarrassed by his metaphysical speculations. [...] They have made their peace with the once incredible notion that the man who discovered new laws of planetary motion and set the astronomical enterprise on modern foundations was also a Neoplatonic enthusiast, astrologer, and panpsychist.<sup>38</sup>

Undoubtedly, this diversity poses a challenge but Lindberg, like many other historians of science, was not prepared to meet the challenge and resigned himself to an account of diversity.

In the opening remarks to the 4th book of his *Epitome of Copernican Astronomy*, Kepler writes explicitly:

the philosophy, which I represent, however, most of it was discovered by others; though indeed, I do not present it in slavish dependence but have put it together from different authors, so that one can see how each in his own way has acquired parts of the truth. I build my whole astronomy, upon Copernicus' hypotheses concerning the world, upon the observations of Tycho Brahe, and lastly upon the Englishman, William Gilbert's philosophy of magnetism [...], for me, there is so much importance in the true doctrine of others or even in correcting the doctrines which are

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Cassirer E. – Kristeller P.O. – Randall J.H. Jr. (eds.), *The Renaissance Philosophy of Man* (Chicago: 1948 [1486]) 223–254, and Kristeller P.O., "Introduction", in *ibidem* 215–222.

37 Quoted by Danilov – Smorodinskii, "Kepler and Modern Physics" 704; Baumgardt, *Johannes Kepler* 81; *KGW* vol. XVI, 197.

38 Lindberg D.C., "The Genesis of Kepler's Theory of Light: Light Metaphysics from Plotinus to Kepler", *Osiris*, 2nd series 2 (1986) 5.



not in every respect well established, that my mind is never at leisure for the game of inventing new doctrines that are contrary to the true.<sup>39</sup>

Similarly, in his *Apologia pro Tychone contra Ursura*, written around Christmas 1600, Kepler compares the method of *regula falsi* (by which one can obtain a solution of an equation through successive approximations) with the successive corrections of an astronomical hypothesis in the quest for a better fit between calculations and observations. 'In what is known as the "rule of the false"', Kepler writes in his ninth objection to Ursus,

a number is sought which when handled by the prescribed rules will come to some particular value. Whatever number comes to mind is chosen and handled by the rules laid down, and if it comes to the value hoped for it is the number sought; but if it comes to less it is false. The same thing is tried out on another [number] and the two are compared, as are their deviations, and from the inspection of these things the true [number] is eventually elicited. I shall now say, using the same form of words, what in astronomical hypotheses is similar to this. Hypotheses are sought which will correspond to the motions of the heavens. The Alphonsine hypotheses are found to err, likewise the Copernican. But the skilful practitioner, having made a comparison of the two and having removed the sources of error, establishes some third [hypothesis] which avoids all error in the prediction of the motions of the heavens and in that way corrects both hypotheses.<sup>40</sup>

This 'astronomical *regula falsi*' is one of the philosophical and methodological arguments with which Kepler intended to counter, as Jardine puts it, 'Ursus' denial of the capacity of astronomers to "portray the form of the world".<sup>41</sup> But as we have seen in the *Astronomia nova*, Kepler—undoubtedly a 'skilful practitioner'—applied in effect this very method to reach a better fit between calculations and observations, and thereby arrived at a great astronomical discovery.

39 KGW vol. VII, 254–255; Kepler, *Epitome of Copernican Astronomy* 850; Baumgardt, *Johannes Kepler* 122.

40 Quoted by Jardine N., *The Birth of History and Philosophy of Science: Kepler's A Defence of Tycho against Ursus with Essays On its Provenance and Significance* (Cambridge: 1984) 149–150; for the Latin, see *ibidem* 95–96.

41 *Ibidem* 1.

That Kepler sought unity and reconciliation can be seen in his attitude towards the church, which was marked at that time by strife and division. As Duhem characteristically puts it, 'Kepler was a Protestant, but deeply religious'.<sup>42</sup> Kepler indicated, however, that he was neither Lutheran nor Calvinist, nor Jesuit, according to their kind. 'It hurts me in my heart', he writes, that

the three great factions have amongst them torn the truth so badly so that I must gather it piecemeal wherever I can find a piece. But I don't have to pay back in equal coin. I rather work hard to reconcile the parties where I can do it with truth, in order to after all hold it with many of them. This is why others think of me as a mocking bird when I say against them, I hold it in most cases with two parties against the third. But look, I like either all three parties, or at least two against the third, in the hope of concord. My opponents, however, all like each only one single party.<sup>43</sup>

The search for a common denominator thus became a constant motive in Kepler's theological thinking. Indeed, Kepler refused to subscribe to the *Formula of Concord*, which differentiated Lutherans from both Catholics and Calvinists. It was the definitive confessional norm at the time when Kepler studied in Tübingen.<sup>44</sup> Kepler's moral objection led later to many personal difficulties with the university authorities and ultimately constituted a significant factor in the objection of the authorities in 1618 to the appointment of Kepler to a professorship in Tübingen.<sup>45</sup>

In contrast to Galileo, who pursued the nature of a phenomenon by isolating it methodologically as well as epistemologically, Kepler considered his task a God-given mission to understand the divine work of creation as a whole; a unifying outlook was therefore imperative. Kepler's work is imbued with the spirit of unity; his commitment to unity is first and foremost a religious experience which enhances the belief in the existence of ultimate laws: the

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42 Duhem P., *To Save the Phenomena* (Chicago: 1969) 100.

43 Quoted by Gerdes E.W., "Johannes Kepler as Theologian", in Beer – Beer (eds.), *Kepler, Four Hundred Years* (Oxford: 1975) 366.

44 Barker, "The Role of Religion" 68 n.22, 87; Methuen C., *Kepler's Tübingen: Stimulus to a Theological Mathematics* (Aldershot: 1998); Kozhamthadam J.S., *The Discovery of Kepler's Laws: The Interaction of Science, Philosophy, and Religion* (Notre Dame: 1994); Hübner J., *Die Theologie Johannes Keplers zwischen Orthodoxie und Naturwissenschaft* (Tübingen: 1975); Methuen C., "To Delineate the Divinity of the Creator: The Search for Platonism in Late Sixteenth-century Tübingen", in Greyerz K. von – Kaufmann T. (eds.), *Religion und Naturwissenschaften im 16. und 17. Jahrhundert* (Gütersloh: 2010) 186–197.

45 Caspar M., *Kepler 1571–1630*, trans. C.D. Hellman (New York: 1962).

laws of creation. Within this religious framework Kepler developed his ideas by attempting to combine the contradictory elements of the concrete and the abstract, that is, physics and mathematics. 'In every physical object, physical laws [*leges corporis*], numbers and proportions have been laid down by God', writes Kepler to Herwart, the Bavarian Chancellor, in 1599.<sup>46</sup> *Leges corporis* is the crucial phrase; it is an expression that represents the attempt to view the concrete and the abstract as a unity.<sup>47</sup> 'God wanted us to recognize [these laws]', Kepler writes further to Herwart, 'by creating us after his own image so that we could share in his own thoughts'.<sup>48</sup>

In an incisive study, Barker and Goldstein explored the theological foundations of Kepler's astronomy. They base their new reading of Kepler on the claim that it is theology and, specifically, Lutheran theology which connects in Kepler's astronomy the physical arguments with the mathematical arguments. Barker and Goldstein argue that 'if the study of natural philosophy is to lead Lutherans to God, this activity presupposes that the providential order of the world is accessible to the human intellect. God's plan for the world is in principle knowable by man'.<sup>49</sup> Kepler believed himself indeed to have produced just that, namely, he claimed, in Barker and Goldstein's words, 'to have uncovered, once and for all, the structure of God's providential plan for the cosmos as a whole, and particularly for the arrangement of the planets'.<sup>50</sup>

On this view, Kepler's natural philosophy is essentially theological in character; by a series of arguments, it establishes 'a unique ordering of the polyhedra. There was one and only one way of arriving at the correct numbers, and this was the mark of an *a priori* demonstration'.<sup>51</sup> This is in fact what makes the plan discoverable: it turns out to be essentially geometrical. Knowledge secured in this way is literally guaranteed by God so no further epistemological guarantees are needed. Such knowledge is accessible by the natural light of reason which vouches for knowledge of mathematical truths and of the moral law. The inquiry that follows the natural light of reason results in archetypes,

46 KWG vol. XIII, 308.

47 See n. 36, above.

48 KWG vol. XIII, 309; quoted by Baumgardt, *Johannes Kepler* 50; on natural laws, see Barker P., "Kepler and Melanchthon on the Biblical Arguments against Copernicanism", in Meer J.M. van der – Mandelbrote S. (eds.), *Nature and Scripture in the Abrahamic Religions*, vol. 1: *To 1700* (Leiden: 2008) 585–604.

49 Barker P. – Goldstein B.R., "Theological Foundations of Kepler's Astronomy", *Osiris* 16 (2001) 97.

50 Ibidem 99.

51 Ibidem 101.

which in Kepler's methodology stand apart from laws—the latter being the result of actual observations of nature.

Barker and Goldstein propose an insightful characterization of the distinction between archetypes and laws, the two key methodological concepts in Kepler's astronomy:

The essential difference between archetypes and laws is that the discovery of archetypes depends on mathematical knowledge alone, whereas the discovery of laws requires an investigation and observation of nature. [...] [A]rchetypes display the eternal time-invariant features of the divine plan, whereas *exemplum* arguments are used to discover the laws governing the features of the plan that vary in time, such as the positions, distances, and velocities of the planets.<sup>52</sup>

Being eternally fixed as fountain-heads of the providential plan, one cannot err about the archetypes once they are established. Thus, the ordering of the polyhedra and the understanding that 'forces [...] attenuate with distance' constitute knowledge which, according to Barker and Goldstein, Kepler maintained with 'theological certainty'.<sup>53</sup> Kepler could not have conceived himself mistaken with respect to the archetypes.

The fundamental theological principles guarantee for Kepler and other Lutherans that knowledge of God's providential plan is intelligible to man and one cannot be in error about this plan.<sup>54</sup> As Barker and Goldstein write, 'the conviction that God has created the world according to an intelligible plan, that he, Kepler, has discovered, underlies the claims to knowledge in both *The Sacred Mystery of the Cosmos* and *A New Astronomy Based on Causes*'.<sup>55</sup> However, in the former cosmological work it is the natural light of reason

52 Ibidem 106.

53 Ibidem 107, 108.

54 Kepler's theological views were not unique; they were shared among a group of other Lutherans influenced by Philipp Melanchthon (1497–1560); on the Lutheran approach to astronomy, see, e.g., Barker P., "The Lutheran Contribution to the Astronomical Revolution: Science and Religion in the Sixteenth Century", in Brooke J. – Ihsanoglu E. (eds.), *Religious Values and the Rise of Science in Europe* (Istanbul: 2005) 31–62; Methuen C., *Science and Theology in the Reformation: Studies in Theological Interpretation and Astronomical Observation in Sixteenth-Century Germany* (London: 2008); Granada M. – Mehl E. (eds.), *'Nouveau Ciel, Nouvelle Terre': La révolution copernicienne dans l'Allemagne de la Réforme 1530–1630* (Paris: 2009); Westman R.S., *The Copernican Question, Prognostication, Skepticism, and Celestial Order* (Berkeley – Los Angeles – London: 2011).

55 Barker – Goldstein, "Theological Foundations of Kepler's Astronomy" 112.

that vouches for the certainty of the *a priori* demonstration of the structure of the world, while in the latter astronomical work it is, according to Barker and Goldstein, a certain kind of argument which underlies the knowledge of the laws by which God governs the providentially ordered world.<sup>56</sup> While knowledge of the cosmological plan is certain, knowledge of the laws may be in error. Indeed, the *Astronomia nova* is an autobiographical account of errors and false starts—the meandering search for the planetary laws of motion.<sup>57</sup>

It is likely that Kepler's theological commitments made Sarton assess Kepler's writings as 'almost repulsive by their prolixity, obscurity and mysticism'.<sup>58</sup> In contrast, Galileo's writings are in Sarton's view 'models of clear, terse, beautiful language; they are amongst the greatest classics of scientific literature'.<sup>59</sup> Rosen concurs with this judgment and suggests that 'the German's [Kepler's] obscurity, prolixity and mysticism were so repulsive to Galileo that he was disinclined to go digging for the nuggets of real gold hidden away in Kepler's heap of dross'.<sup>60</sup> So much so that Galileo had not even referred to Kepler's laws in his *Dialogue*, which was published in 1632, two years after Kepler's death.<sup>61</sup> Panofsky, the art historian, maintains that Galileo's failure to mention Kepler's laws is not a mere didactic tool to make the Copernican system easily comprehensible to the general reader. Rather, it is a consequence of his deep-seated objection to any violation of the principle of separation, the very principle which dominated Galileo's thought. According to Panofsky, Galileo was haunted by the principle of separation: he loathed complexity, imbalance, and all kinds of conflation.<sup>62</sup> If this view of Galileo is correct, then the essential tension between Kepler and Galileo is unity versus compartmentalization.

This unifying conception underlies an important methodological principle to which Kepler adhered strictly. As he formulated it, '[e]ven if the conclusions of two hypotheses coincide in the geometrical realm, each hypothesis will have its own peculiar corollary in the physical realm. But practitioners are not always in the habit of taking account of that diversity in physical matters.'<sup>63</sup>

56 Ibidem 112–113.

57 Hon G., "On Kepler's Awareness of the Problem of Experimental Error", *Annals of Science* 44 (1987) 545–591.

58 Sarton, "A Review of J. Kepler's *Die Zusammenklänge der Welten*" 513.

59 Ibidem.

60 Rosen E., "A Review of E. Panofsky's *Galileo as a Critic of the Arts*", *Isis* 47 (1956) 79.

61 Galileo Galilei, *Dialogues Concerning Two New Sciences*, trans. H. Crew – A. de Salvio (1st ed. 1638; New York: 1954).

62 Panofsky E., "Galileo as a Critic of the Arts—Aesthetic Attitude and Scientific Thought", *Isis* 47 (1956) 5–6, 9–10, 13–15.

63 Jardine, *The Birth of History and Philosophy of Science* 141–142.

The idea is, for example, that even though the eccentric and epicyclic models are geometrically equivalent, their representations as orbs are completely different. Indeed, orbs had traditionally been understood to be physical and material, and so in the heavens one must have either one set or the other. The difficulty, as described by Kepler's predecessors, is that we cannot go up to the heavens to see which set of orbs is there. As we have seen, Kepler would have none of this confusion; he eliminated the orbs and introduced the orbit as the fundamental concept.

Kepler announced in his *New Astronomy* the discovery that the orbit of a planet is 'an oval path, perfectly elliptical'. He reported that he obtained this result by carrying out 'most laborious proofs and [...] computations on a very large number of observations'.<sup>64</sup> But this was not enough. For Kepler a successful matching of calculations with observations is not sufficient; the pattern hidden in the observations has to be accessible to explanation based on physical causes. Three distinct domains, namely, geometry, physics, and observational data, constitute for Kepler the framework for the execution of the needed reformation of astronomy. But it is the overarching theological perspective which unifies the knowledge thus generated.

To conclude on a Machian point: in his celebrated *Mechanics* (1883), Mach asks the following question: 'If the point of view of theology which led to the enunciation of the principles of mechanics was utterly wrong, how comes it that the principles themselves are in all substantial points correct?' And we can of course formulate a similar question in the astronomical context. Mach's reply is striking; it consists of two moves:

The answer is easy. In the first place, the theological view did not supply the *contents* [*Inhalt*] of the principles, but simply determined their *guise* [*Färbung*]; their matter was derived from experience. [...] In the second place, the theological conception of nature itself owes its origin to an endeavor to obtain a more comprehensive view of the world:—the very same endeavor that is at the bottom of physical science. Hence, even admitting that the physical philosophy of theology is a fruitless achievement, a reversion to a lower state of scientific culture, we still need not repudiate the *sound root* [*gesunde Wurzel*] from which it has sprung and which is not different from that of true physical inquiry.<sup>65</sup>

64 Kepler, *New Astronomy* 68.

65 Mach E., *The Science of Mechanics: A Critical and Historical Account of its Development*, 6th ed., trans. T.J. McCormack (1st ed. 1883; Illinois: 1974) 555, italics in the original.

The answer to whether theology could have an impact on the scientific content, whether Kepler's theology could have determined his new astronomy, is complex and certainly interpretative. But it is definitely the case that Kepler's stance is the 'comprehensive view of the world' which sprang from the 'sound root' of theology.

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# Natural Theology as Superstition: David Hume and the Changing Ideology of Natural Inquiry<sup>1</sup>

*Tamás Demeter*

## Summary

As is frequently emphasized, it was a common conviction of early modern natural philosophers that God had written two books, the Bible and the Book of Nature, and that studying the latter was to study God through his creation. Early modern natural philosophy and modern science are partly distinguished by the former's intimate relation to God: natural philosophers frequently talked with God in mind even when they were not directly talking about him. This is clearly true of many of Hume's contemporaries. In this essay I wish to focus on sections X and XI of Hume's first *Enquiry*, and to argue that their arguments are complementary if read in this context. The former argues against the possibility of founding knowledge claims on revealed religion; the latter argues against the possibility of acquiring knowledge about transcendent matters on the basis of natural inquiry. By challenging the cognitive authority of religion, Hume undermines the dominant ideology of natural inquiry that made sense of contemporary cognitive practices by at least implicit reference to God. Hume's work is therefore ideological in this context: he works to distance cognitive practices from religious epistemic ideals, and argues for replacing them with secular methodological standards. This is the legacy which he contributes to the emerging self-image of modern natural science.

## Introduction

Natural theology, or physico-theology as it is sometimes called, was unquestionably an important part of early modern natural inquiry. The need for a

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discipline aimed at an understanding of God through the study of his creation arose from the widespread conviction that the world is the product of God's handwork. As such, God's intentions, attributes, and purposes were taken to be reflected, to some significant degree, not only in the Bible but also in his creation: God had written two books to be studied by different means, i.e. the Bible and the 'Book of Nature'.<sup>2</sup> As two books ascribed to the authorship of God, knowledge about the world perceived as God's creation had to be reconciled with knowledge contained in Holy Scripture perceived as God's word. In this enterprise the resources of natural philosophy and theology had to be combined so as to reach a joint cognitive purpose: a Christian understanding of the world.

As Stephen Gaukroger points out, this aspiration was especially strong among the 'Royal Society apologists' who, in the aftermath of Robert Boyle and Thomas Sprat, 'were talking of natural philosophy in terms of a religious office, and natural philosophy was taken as a non-partisan way—that is, one free of sectarian confessional issues—of engaging religious questions of divine nature and purpose'.<sup>3</sup> Andrew Cunningham, in a similar vein, sees the role of natural theology in early modern natural inquiry as so central that on this basis he denies the continuity of natural philosophy and modern science. Natural philosophy is about God even when its practitioners are not talking about him, a feature entirely uncharacteristic of modern science: 'no-one ever undertook the practice of natural philosophy without having God in mind, and knowing that the study of God and God's creation—in a way different from that pursued by theology—was the point of the whole exercise'.<sup>4</sup> And even if John Henry's verdict in the debate surrounding Cunningham's thesis may very well be true, namely that '[n]atural philosophers, after all, were not theologians, and would have seen it as a betrayal of their natural philosophical principles to invoke God's direct intervention in their explanations',<sup>5</sup> the conviction that natural philosophers were studying God's creation provided the basic *ideological framework* of early modern science: this was a background presupposition

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2 See Shapin S., *The Scientific Revolution* (Chicago: 1996) 78.

3 Gaukroger S., *The Collapse of Mechanism and the Rise of Sensibility Science and the Shaping of Modernity, 1680–1760* (Oxford: 2010) 30.

4 Cunningham A., "How the Principia Got Its Name; Or, Taking Natural Philosophy Seriously", *History of Science* 29 (1991) 377–392, here 388. For a discussion see Grant A., "God and Natural Philosophy: The Late Middle Ages and Sir Isaac Newton", *Early Science and Medicine* 5 (2000) 279–298.

5 Henry J., "Voluntarist Theology at the Origins of Modern Science: A Response to Peter Harrison", *History of Science* 54 (2009) 110 n.65.

against which the significance of the enterprise was perceived and the ultimate meaning of its findings was ascribed. This ideology of knowledge was not superadded to the works of knowledge production: it was an intimate and unavoidable part of the framework of intelligibility, and not external to knowledge claims themselves.<sup>6</sup>

This stance concerning the significance of natural philosophy is well reflected in Newton's writings throughout his *oeuvre*. The anti-Cartesian position he elaborated in the 1670s was partly motivated by theological reasons.<sup>7</sup> As opposed to Descartes's model of the universe that required no intervention for its maintenance,<sup>8</sup> Newton's model entailed a voluntaristic theology that supplied the world with God's necessary intervention and regulation.<sup>9</sup> The intimate relation between Newton's natural philosophy and theology is openly formulated as a dictum in the General Scholium first added to the second edition of the *Principia* (1713), where Newton proclaims that 'to treat of God from phenomena is certainly a part of natural philosophy',<sup>10</sup> a view also expressed in an earlier manuscript with methodological implications:

We see the effects of a Deity in the creation and thence gather the cause and therefore the proof of a Deity and what are his properties belongs to experimental Philosophy. 'Tis the business of this Philosophy to argue from the effects to their causes till we come at the first cause.<sup>11</sup>

As Newton envisaged in Query 31 of the *Opticks* (1721), our knowledge of the 'first cause' gained from natural philosophy would eventually bring along an 'enlargement' of moral philosophy: 'For so far as we can know by natural philosophy what is the first cause, what power he has over us, and what benefits we receive from him, so far our duty towards him, as well as that towards one another, will appear to us by the light of nature'.<sup>12</sup>

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6 This is aptly illustrated in the Leibniz-Clark correspondence. See Shapin S., "Of Gods and Kings: Natural Philosophy and Politics in the Leibniz-Clark Disputes" *Isis* 72 (1981) 187–215.

7 Gucciardini N., *Isaac Newton on Mathematical Certainty and Method* (Cambridge, MA: 2009) 15; Snobelen S., "The light of nature': God and Natural Philosophy in Isaac Newton's *Opticks*", unpublished manuscript. (Spanish version: *Estudios de filosofía* 35 (2007) 15–53.)

8 See e.g. Wilson C., *Epicureanism at the Origins of Modernity* (Oxford: 2008) 98–100.

9 Newton Isaac, "De Gravitatione" in *Philosophical Writings* (Cambridge: 2004).

10 Newton Isaac, *Philosophical Writings* 92.

11 Newton ms. Add. 3970 (B), fol. 619v. Quoted in Snobelen, "The Light of Nature'".

12 Newton, *Philosophical Writings* 140.

Newton's views on the close connection between theological and natural knowledge were frequently echoed among his early eighteenth-century Scottish followers. George Cheyne in his 1715 *Philosophical Principles of Religion, Natural and Revealed* discusses in two parts the extent of knowledge of God to be gained through the study of nature, and the prospects for coupling the arithmetic of infinities with revealed religion. Although in this work Cheyne was sensitive to the limitations of combining religion with knowledge of nature, he simply perceived the aims and insights of natural philosophy as intrinsically unified with Christian religion.<sup>13</sup>

Perhaps the most original Scottish Newtonian, Colin Maclaurin, in his introduction to Newton's ideas posthumously published in 1748, when Hume's first *Enquiry* was also published, likewise sees the significance of natural philosophy in leading

to the knowledge of the Author and Governor of the universe. To study nature is to search into his workmanship: every new discovery opens to us a new part of his scheme. Our views of Nature, however imperfect, serve to represent to us in the most sensible manner, that mighty power which prevails throughout, acting with a force and efficacy that appears to suffer no diminution from the greatest distances of space or intervals of time; and that wisdom which we see equally displayed in the exquisite structure and just motions of the greatest and subtlest parts. These, with perfect *goodness*, by which they are evidently directed, constitute the supreme object of the speculations of a philosopher; who, while he contemplates and admires so excellent a system, cannot but be himself excited and animated to correspond with the general harmony of nature.<sup>14</sup>

This perspective from which nature is perceived as reflecting 'the perfect goodness' of its creator suggests an obvious way of unifying natural and moral philosophy, a way that was taken by some Scottish moral philosophers. Most notable is perhaps George Turnbull's *The Principles of Moral and Christian Philosophy* (1740), which makes an attempt to establish the principles on the basis of which moral philosophy can be made out to be continuous with the spirit and content of Newton's *Principia*.<sup>15</sup> Turnbull's central idea is this: regular and orderly appearances are due to the rule of laws in nature, and a

13 See Guerrini A., *Obesity and Depression in the Enlightenment* (Norman: 1999) 85–87.

14 Maclaurin Colin, *An Account of Sir Isaac Newton's Philosophical Discoveries*, 3rd ed. (London: 1775) 3f.

15 Turnbull George, *The Principles of Moral Philosophy* (Indianapolis: 2005) 48ff.

physical explanation is given if an effect is subsumed under physical laws. Some of these laws are such that they produce 'good, perfection and beauty' in the material world,<sup>16</sup> and an effect is thus accounted for morally if it is shown to be produced by such laws. Explaining phenomena in this way is the *part* of natural philosophy that can be called moral philosophy.

This is the context in which in this paper I wish to read Hume's sections on miracles and particular providence. The intricate connection between these two passages has already been noted,<sup>17</sup> but their historical relevance is most typically detected in the context of religious debates. Here I wish to suggest that in these sections Hume challenges the foundations of those claims of knowledge that concern the connection between the transcendent and natural spheres. This perspective, amply illustrated above, implies the cognitive authority of revealed religion on the one hand, and suggests the transcendent implications of natural inquiry on the other.

Hume has complaints against this view in both respects: in the section 'Of Miracles' he denies that revelation can have relevance for natural inquiry in exploring the ways of nature; 'Of a Particular Providence and Future State' denies the possibility of incorporating natural philosophical insights into the Christian understanding of the world.<sup>18</sup> The lesson is that natural theology is bordering on superstition as Hume understands it, in contrast to philosophy:

superstition is much more bold in its systems and hypotheses than philosophy; and while the latter contents itself with assigning new causes and principles to the phaenomena, which appear in the visible world, the former opens a world of its own, and presents us with scenes, and beings, and objects, which are altogether new.<sup>19</sup>

Despite undermining the cognitive authority of religion, Hume leaves open, at least in the first *Enquiry*, the possibility that religion can have non-cognitive but moral value. Therefore Hume's critique of religion in these two sections concerns only the epistemic status of religion, and thereby he contributes to the emergence of a secular ideology of natural inquiry. This is the significance

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<sup>16</sup> Turnbull, *Principles* 50.

<sup>17</sup> See e.g. Buckle S., *Hume's Enlightenment Tract: The Unity and Purpose of An Enquiry concerning Human Understanding* (Oxford: 2001) 238ff.

<sup>18</sup> Hume David, *An Enquiry concerning Human Understanding* (1st ed. 1748; Oxford: 2000).

<sup>19</sup> Hume David, *A Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects* (1st ed. 1739/40; Oxford: 2007) 1.4.7.13.

of Hume's teaching in the context of contemporary knowledge production that I would like to spell out here.

### Revealed Religion and Knowledge of Nature

As his correspondence testifies, Hume originally conceived his argument against the reliability of miracle reports while in discussion with a Jesuit at the time of writing up the *Treatise* in La Flèche around 1735.<sup>20</sup> Yet he eventually decided not to include it in the published text, fearing, as he explained in another letter, that it 'will give too much offence'.<sup>21</sup> Cheyne's work mentioned above may have served as an important inspiration for the critique advanced against testimony on miracles and the argument from design in the *Enquiry* as well as in *Dialogues on Natural Religion*.<sup>22</sup>

As Hume sees it, testimony on miracles provides the sole foundation of Christian religion: the 'authority' of both 'scripture and tradition' rests exclusively on the testimony of the apostles.<sup>23</sup> This authority for Hume cannot be anything but *cognitive authority*: a claim of knowledge which must be evaluated in the context of other claims of knowledge, a source of epistemic value to be judged in comparison with other sources. Right from the beginning, Hume discusses miraculous testimony and the questions of religion in a cognitive context, not contemplating the possibility that miraculous testimony or revelation could be a special source of epistemic value that is to be judged by standards different from more common sources of knowledge. Miraculous testimony is placed alongside profane testimony and by Hume's standards they are to be judged uniformly, and therefore testimony, in religious matters is treated just as a special case of the more general problem in the epistemology of testimony.<sup>24</sup> The specificity of miraculous testimony in religious matters is due to the fact that 'violations of truth are more common in the testimony concerning religious miracles',<sup>25</sup> because 'if the spirit of religion join itself to

20 Letter to George Campbell, 7 June, 1762. In *Letters of David Hume*, ed. J.Y.T Greig (Oxford: 1932) vol. 1, 361.

21 Letter to Henry Home, 2 December, 1737. In *Letters* vol. 1, 24.

22 Wright J.P., "Dr. George Cheyne, Chevalier Ramsay, and Hume's Letter to a Physician", *Hume Studies* 29 (2003) 125–141, here 129, 137 nn.28 and 29.

23 Hume, *Enquiry* 10.1.

24 On the general epistemological relevance of Hume's section see Gelfert A., "Hume on Testimony Revisited", *Logical Analysis and the History of Philosophy* 13 (2010) 60–75.

25 Hume, *Enquiry* 10.38.

the love of wonder, there is an end of common sense; and human testimony, in these circumstances, loses all pretensions to authority'.<sup>26</sup>

This exclusively cognitive perspective is also reflected in Hume's recurrent use of the phrase 'system of religion', which is much more frequent in this section than in Hume's other discussions of religious phenomena.<sup>27</sup> Given the several other contexts in which Hume uses 'system', he seems to imply that religion is an organized body of knowledge on a par with systems of natural and moral philosophy, and therefore it has to be judged by the same epistemological standards. By these standards, religion counts as a body of empirical knowledge: sacred texts and tradition report natural and historical events that are frequently miraculous; make predictions in the form of prophecies; and provide explanations that are again frequently miraculous. These are all statements on factual matters, and therefore the epistemic value of revealed religion is to be measured by an appeal to the court of experience in front of which miracle reports can be either rejected as falsities or admitted as 'proofs' or 'probabilities'.

The categories of proof and probability in Hume's epistemology are reserved for empirical knowledge claims, and they are contrasted with the certainty of *a priori* truths, that amounts to a 'demonstration'. The difference between proofs and probabilities consists in their different degrees of certainty. Proofs are 'such arguments from experience as leave no room for doubt or opposition'<sup>28</sup> and laws of nature are supported by such arguments. Probability arises 'where different effects have been found to follow from causes, which are to *appearance* exactly similar'.<sup>29</sup> It is to be emphasized that 'proof' and 'probability' are epistemic categories that concern the nature of our knowledge, and not ontic categories that concern the nature of the things in themselves. Therefore, even if we have full proof that an event has occurred in specific circumstances, it may turn out to be otherwise in the future. And similarly, the fact that on the basis of past observation we can only ascribe a certain probability to events arising from causes that are 'to *appearance* exactly similar', does not entail that those events could not be subsumed under strict laws should we inquire further into their hidden constitution or should we have more perfect cognitive faculties.

Now, in front of the court of experience, miraculous testimonies cannot stand a good chance of being accepted as proofs because unanimous experi-

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26 Ibidem 10.17.

27 Ibidem 10.35, 36, 38.

28 Ibidem 6. n.10.

29 Ibidem 6.4.



ence speaks against them. Hume defines 'miracle' as 'a violation of the laws of nature', and goes on to say that, since 'a firm and unalterable experience has established these laws, the proof against a miracle, from the very nature of the fact, is as entire as any argument from experience can possibly be imagined'.<sup>30</sup> Although Hume draws a distinction between two kinds of extraordinary phenomena, namely the 'miraculous' and the 'marvellous', the two categories, given Hume's definition, seem to merge.<sup>31</sup> As the famous example of the Indian prince, who refuses on the basis of his past experience to believe that water can be frozen and perfectly hard, seems to suggest, the distinction between the two categories consists in the fact that a miracle is contrary to uniform experience, while a marvel is just 'not conformable to it'.<sup>32</sup> The distinction is indeed problematic if miracles, in connection with proof and probability, are discussed as an epistemic category. Given the epistemic conditions of the Indian prince and his society, it may well have been a law of nature supported by unanimous experience that 'water is always in liquid form', and for him the report on the existence of frozen water may legitimately seem miraculous, and not only marvellous.

Given Hume's definition, a system based on miraculous testimony is by definition in epistemic disadvantage if compared to natural philosophical systems that establish the laws of nature by uniform observation and experience. And given that miracles, especially those reported by sacred texts, are typically unique—i.e. a single case reported by a single person—their probability is negligible against the uniform experience that speaks against them. Even if truthfulness could be presupposed as a convention with full compliance

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30 Ibidem 10.12. The definition in the main text, which can be taken as Hume's official definition, treats 'miracle' as an epistemic category. There is, however, a more restricted definition given in a footnote (Hume, *Enquiry* 10.12 n.23) which requires that the violation of a law of nature be the consequence of divine intervention: 'A miracle may be accurately defined, *a transgression of a law of nature by a particular volition of the Deity, or by the interposition of some invisible agent*. A miracle may either be discoverable by men or not. This alters not its nature and essence.' The definition sounds more ontological than epistemic, as it does not involve reference to our epistemic condition. In the present context I am focusing exclusively on the official definition.

31 See the discussion of Joan of Arc in Hume David, *The History of England from the Invasion of Julius Caesar to the Revolution of 1688* (Indianapolis: 1983) vol. II, 398–404.

32 Hume, *Enquiry* 10.10. For a discussion of related problems see Earman J., *Hume's Abject Failure: The Argument Against Miracles* (Oxford: 2000) 34ff. As he puts it, Hume 'was able to create the illusion of a powerful argument by maintaining ambiguities in his claims against miracles' (ibidem 70). It seems to me that the ambiguity of 'miracle' and 'marvel' is the most important.

among members of a community, miracle reports cannot be trusted, because there are several other circumstances: mistakes, misperceptions, and other distortions like the agreeable passions ‘of *surprise* and *wonder*, arising from miracles’<sup>33</sup> whose possibility should make us suspicious as to the truthfulness of a miracle report.

Our reliance on testimony is derived exclusively from ‘our observation of the veracity of human testimony’, namely that we find memory is ‘tenacious to a certain degree’, and that people have ‘an inclination to truth’ and are ‘sensible to shame, when detected in a falsehood’.<sup>34</sup> But we equally know from experience that there are conflicting testimonies that may arise from the ‘character’ of the witnesses or the ‘manner of their delivering their testimony’.<sup>35</sup> All these circumstances are to be weighed while deciding whether to accept a testimony as proof or probability, or reject it altogether. And even if all disturbing circumstances could be eliminated, and therefore a miraculous testimony were to be accepted, there would still be proof against proof—one perfectly reliable testimony against unanimous experience, which at most can entail a ‘mutual destruction of arguments’.<sup>36</sup>

Our knowledge of the limited reliability of human testimony should make us cautious during the process of evaluating testimonies: we should proportion our belief to the evidence.<sup>37</sup> And testimony as evidence is, and should always be vulnerable because of our knowledge of its fallibility. Therefore, when testimony conflicts with past experience that amounts to full proof, testimony is bound to be rejected, no matter who provides it, the apostles, Cato, or whom-ever we may be inclined to trust: ‘The incredibility of a fact [...] might invalidate so great an authority.’<sup>38</sup> As Hume’s normative epistemological principle has it, ‘no testimony is sufficient to establish a miracle, unless the testimony be of such a kind that its falsehood would be more miraculous, than the fact, which it endeavours to establish’.<sup>39</sup> And given our knowledge of the fallibility of human testimony it is hard to imagine a case like that, and therefore ‘perhaps, it will be impossible to find any such in all records of history’.<sup>40</sup>

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33 Hume, *Enquiry* 10.16.

34 Ibidem 10.5.

35 Ibidem 10.7.

36 Ibidem 10.13.

37 Ibidem 10.4.

38 Ibidem 10.9.

39 Ibidem 10.13.

40 Ibidem 10.36.

As Stephen Shapin has pointed out, Hume's impersonalized standard of testimonial acceptance reflects the changing standards of credibility.<sup>41</sup> For most of the early modern period personal *virtue* was considered to be the foundation of trust in one's testimony: as truthfulness was associated with certain virtues by which certain types of persons could have been identified as reliable. The gentleman was the ideal participant in knowledge-making practices whose virtues like gentility independence, integrity, and identity, in connection with his economic and social status, ensured his reliability. For Hume, however, these features and character traits are irrelevant in evaluating testimonial support for knowledge claims. Although 'integrity' and 'reputation' remain important features of the witness, because they warrant his personal credibility, especially when testimony is given in 'a public manner' so as to make the detection of falsity unavoidable, Hume does not connect these virtues to social status. And what is more important, he places the primary emphasis on 'unquestioned good sense, education, and learning',<sup>42</sup> which suggests that Hume is inclined to replace personal virtue by *expertise*, thereby gesturing toward the detachment of moral considerations from the cognitive value of testimony.<sup>43</sup> Having the moral standing of a prophet or an apostle or Cato contributes little to the credibility of a testimony without being a competent observer.

A competent observer should always be reluctant to accept a miracle report not only because it is potentially always fallible when confronted with full proof, but also because a competent observer must have several methodological precepts in mind that should prevent him from admitting such testimony. Admitting a miracle as empirical evidence would violate sober cognitive norms like that of *explanatory reduction* that suggests we should aim in our cognitive enterprises at subsuming phenomena under a limited number of laws.<sup>44</sup> This norm arises from the empirical study of human nature that reveals the 'maxim' that the observation of past events is a good guide for our expectations of future and unobserved phenomena.<sup>45</sup> But if miracles are admitted as real phenomena in nature then the 'whole frame of nature is disjointed,

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41 Shapin S., *The Social History of Truth: Civility and Science in the Seventeenth Century* (Chicago: 1994) 410ff.

42 Hume, *Enquiry* 10.15.

43 Professional knowledge emerged as a requirement in the Royal Society's practice toward the end of the seventeenth century. See Daston L. – Park K., *Wonders and the Order of Nature, 1150–1750* (New York: 1998) 249.

44 See Schliesser E., "Copernican Revolutions Revisited in Adam Smith by way of David Hume", *Revista Empresa y Humanismo* 13 (2010) 213–248.

45 Hume, *Enquiry* 10.16.

and every element performs its operations in a different manner, from what it does at present',<sup>46</sup> and therefore admitting miracles violates this norm, which has firm foundations not only in the proper methodology of natural philosophy but in human nature itself. Hume's principle of explanatory reductionism recommends parsimony in introducing new principles for new phenomena and fortitude with respect to established explanatory principles, i.e. laws of nature. Against this background, religious accounts of miracles are *par excellence* cases of introducing *ad hoc* and experientially unfounded principles into our explanations, which reliably indicates that these principles are false.<sup>47</sup>

Furthermore, different miracles are admitted in different systems of religion that are inconsistent with one another, because 'the direct scope' of a miracle

is to establish the particular system to which it is attributed; so has it the same force, though more indirectly, to overthrow every other system. In destroying a rival system, it likewise destroys the credit of those miracles, on which that system was established; so that all the prodigies of different religions are to be regarded as contrary facts, and the evidences of these prodigies, whether weak or strong, as opposite to each other.<sup>48</sup>

This has two consequences. First, a miracle is not a piece of independent evidence that can be treated as such while constructing systems for explaining phenomena. Its only function is to establish a system to which it belongs. The examination of a reported miracle, and its acceptance as veridical, presuppose the system which treats it as a piece of evidence. As Hume puts it in a comment on the manuscript of George Campbell's *Dissertation on Miracles* that attacks Hume's position concerning miracles: 'I never knew any one, that examined and deliberated about nonsense who did not believe it before the end of his inquiries'.<sup>49</sup> This means that a system of religion is immune to cognitive critique from the outside, and the evidence it relies on can have epistemic value only within the frames of that particular system.

46 Ibidem 10.20.

47 It is a cardinal methodological norm for Hume. See Hume, *Treatise* 2.1.3.6–7. For a discussion see Demeter T., "Hume's Copernican Turn" in Neuber W. – Rahn T. – Zittel C. (eds.), *The Making of Copernicus: Early Modern Transformation of a Scientist and His Science* (Leiden: 2015). On the central role of explanatory reduction and its Newtonian origins see Hazony Y., "Newtonian Explanatory Reduction and Hume's System of the Sciences" in Biener Z. – Schliesser E. (eds.), *Newton and Empiricism* (Oxford: 2014) 138–170.

48 Hume, *Enquiry* 10.24.

49 See Hume's letter to Hugh Blair, 1761, *Letters* 1, 350.

Secondly, but not independently, systems founded on their own peculiar miracles are mutually destructive if evaluated from an independent point of view. We have rival systems with mutually exclusive explanatory and predictive content, but whose comparative evaluation is impossible due to their claiming the relevant evidence to be exclusively theirs and inaccessible to others. This begets a situation in which choice between theories is impossible on the basis of cognitive evaluation. This consequence undermines the methodological credibility of systems of religion in accounting for phenomena, and bestows an epistemic advantage on every system of natural philosophy that keeps an eye on these epistemic norms.<sup>50</sup>

*Prima facie* it may seem that Hume's methodological ban on accepting miraculous testimony threatens not only the knowledge claims posed by systems of religion, but also the experimental practices of early modern natural philosophy. When Thomas Sprat, an early historian of the Royal Society, proclaimed that miracles are divine experiments, he also implied that experiments conducted by natural philosophers are analogous with them in being contrary to the commonly observed course of nature.<sup>51</sup> As Lorraine Daston and Katherine Park put it, the 'sciences of nature during this period produced and consumed marvels as never before or since' and this practice was combined with the conviction that 'the sciences would thereby grow'.<sup>52</sup> The practice of experimental natural philosophers entailed the production of phenomena that might seem miraculous and marvellous as Hume understood the terms, i.e. as phenomena contrary or not conformable to uniform experience, and natural philosophers circulated these findings in the form of experimental histories, i.e. testimonies. The production of seemingly miraculous phenomena was conjoined with an appetite for collecting observations of preternatural, outlandish and extraordinary phenomena that 'would serve as an observational approximation of controlled experiments—or rather, as a record of the experiments nature performed on itself'.<sup>53</sup> These phenomena were crying out

50 On Hume's methodological preferences see Demeter T., "Hume's Experimental Method", *British Journal for the History of Philosophy* 20 (2012) 577–599.

51 Sprat T., *The History of the Royal Society of London, for the Improving of Natural Knowledge*, 4th ed. (1st ed. 1667; London: 1734) 352. See also Dear P., "Miracles, Experiments, and the Ordinary Course of Nature" *Isis* 81 (1990) 663–683.

52 See Daston – Park, *Wonders* 215.

53 *Ibidem* 239.

for an explanation and many of them met the epistemic criteria Hume set for miracles and marvels.<sup>54</sup>

Hume, however, allows for the possibility of a miraculous testimony which is 'very extensive and uniform', such that this amounts to a proof. This would have to be a case in which a sufficient number of people with a sufficient degree of credibility testified to some miraculous event:

suppose, all authors, in all languages, agree, that, from the first of January, 1600, there was a total darkness over the whole earth for eight days: Suppose that the tradition of this extraordinary event is still strong and lively among the people: That all travellers, who return from foreign countries, bring us accounts of the same tradition, without the least variation or contradiction: It is evident, that our present philosophers, instead of doubting the fact, ought to receive it as certain, and ought to search for the causes whence it might be derived.<sup>55</sup>

In these, for Hume unlikely, cases the methodological rule is clear: inquire further—unless the event is so unbelievable and contrary to the laws of nature that it does not deserve serious consideration,<sup>56</sup> which is the case especially when a miracle report is connected to some system of religion.<sup>57</sup> A successful search for the causes of allegedly miraculous events entails the *Entzauberung* of the miracle, i.e. it entails the event losing its status as a miracle.

For Sprat a miracle seemed to be a more common phenomenon than it was for Hume, because for Sprat 'there are many *Qualities*, and *Figures*, and *Powers* of things, that break the common Laws, and transgress the standing Rules of *Nature*'. But his attitude to such miraculous phenomena is quite consonant with Hume's: their causes are to be explored as 'it is certain that many things, which now seem *miraculous*, would not be so, if once we come to be fully acquainted with their *Compositions* and *Operations*'.<sup>58</sup> So, Hume's preference for a this-worldly explanation of natural events,

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54 See for example Boyle's comment on Cellini's report of having seen a carbuncle (i.e. a gem blazing in the dark) that seems to be equivalent to the Indian prince's case. This is at least marvellous, but if as I have indicated above, the distinction between miracle and marvel is too blurry to maintain, then it counts as miraculous. Yet Boyle is willing to accept Cellini's testimony. See Boyle Robert, "Natural Phosphory" in *The Philosophical Works of the Honourable Robert Boyle* (London: 1725) vol. III, 149.

55 Hume, *Enquiry* 10.36.

56 Ibidem 10.37.

57 Ibidem 10.38.

58 Sprat, *History of the Royal Society* 214.

even if miraculous, was shared by many early modern British naturalists. As Boyle pointed out, invoking a 'supernatural cause' while studying natural phenomena 'will, I fear, look like shifting off the difficulty, instead of solving it; for we here enquire not into the first and universal, but the proper, immediate, and physical cause'.<sup>59</sup> This preference could easily be extended to miracles reported in the Scripture: it was a possible task of the early modern natural philosopher to understand these events in terms of their secondary causes.<sup>60</sup>

However, Hume dramatically diverged from the followers of Boyle and Newton in the interpretation of such potential explanatory successes: for the former a successful explanation of a miracle meant that the miracle is in fact *explained away* and ceases to be a miracle; for the latter it just meant that the miracle is simply *explained* in terms of the causes by which God had wrought the miracle. But with respect to religious miracles Hume is even more radical. The most fundamental difference between the Royal Society apologists on the one hand, and Hume on the other, reflects different attitudes to the miracles testified by religious tradition. For Hume inquiring into miracles reported by religion is simply pointless—our knowledge of human nature, which is based on history and observation, tells us that 'the violations of truth are more common in the testimony concerning religious miracles, than in that concerning any other matter of fact; this must diminish very much the authority of the former testimony, and make us form a general resolution, never to lend any attention to it'.<sup>61</sup> By contrast, for Boyle 'a naturalist may safely believe all the miracles attested by the holy scriptures',<sup>62</sup> and as he says elsewhere, those miracles 'have a peculiar advantage above most other miracles, on the score of their duration: since the manifest proofs of the predictions continue still, and are as visible as the extent of the Christian religion'.<sup>63</sup>

The main difference between Royal Society apologists and Hume does not consist in the way they suggest miraculous phenomena be treated once they are admitted as phenomena, but in the kind of testimony required for admitting a phenomenon worthy of inquiry. As John Henry points out, a voluntaristic theology that allows for miracles ascribed to God's will is consistent with

59 Boyle Robert, "Experiments and Observations upon Colours" in *The Philosophical Works of the Honourable Robert Boyle* (London: 1725) vol. 11, 44.

60 Henry, "Voluntarism".

61 Hume, *Enquiry* 10.38.

62 Boyle, "Experiments and Observations upon Colours" 44.

63 Boyle Robert, *The Christian Virtuoso*, in *The Philosophical Works of the Honourable Robert Boyle* (London: 1725) vol. 11, 259.



searching for secondary causes<sup>64</sup>—and this is what Hume denies: he does not admit divine miracles as phenomena that deserve to be investigated. Hume sets the threshold for belief in a miracle report higher than most of his predecessors.<sup>65</sup> For Hume, as we have seen, taking religious testimony seriously presupposes religious belief and we know from experience that testimony arising from religious motivation is highly unreliable. Therefore it cannot serve as a foundation of a system with cognitive aspirations. But belief in revealed religion has no other source, and thus the knowledge claims of revealed religion are disqualified.

### Knowledge of God from Knowledge of Nature

The *Enquiry*'s Section XI on particular providence continues to adopt an epistemic perspective on matters of religion, and he repeatedly talks about the 'religious hypothesis' that 'must be considered only as a particular method of accounting for the visible phænomena of the universe' (11.18, see also 21, 26, 27). If compared to the section on miracles, here the epistemic perspective is reverse: Hume is no longer concerned with the epistemic prospects of basing natural knowledge on revealed religion, but with the prospects of distilling knowledge of God from knowledge of nature. In this respect this section is a close relative of Part II of Section VIII, in which Hume discusses the possibility of knowing God through studying human actions. Hume concludes there that studying man with the methods of experimental reasoning is unfit to handle the questions of transcendence, and thus moral philosophy should remain content with 'the examination of common life'.<sup>66</sup> Hume's attitude in section XI concerning the prospects of knowledge in transcendent matters through natural philosophy is quite similar. Although this section is couched in dialogue form, this fact does not pose a serious problem from the present perspective:

64 Henry, "Voluntarism" 91f.

65 On the appetite for strange facts in the context of Baconian natural philosophy see Daston – Park, *Wonders* 250. They argue that the project of enlarging natural history, collecting counterexamples to received natural philosophical axioms, motivating inventions of art, etc. was the main drive behind lowering the threshold of admitting miraculous phenomena. This situation was to change in the 1730s and 1740s—which is, one could add, reflected in Hume's discussion of miracles.

66 Hume, *Enquiry* 8.36. For a detailed discussion see Demeter T., "Liberty, Necessity and Hume's 'Science of Man'", *History of the Human Sciences* 25 (2012) 15–31.



its methodologically relevant considerations are consonant with Hume's other pronouncements.

As Thomas Holden has recently pointed out, Hume's argument aims to defeat the traditional programme of natural theology, as has been illustrated in the introduction, i.e. 'the program of employing natural reason to work our way to species-specific knowledge of the intrinsic character of the original cause'.<sup>67</sup> But Hume does not refrain from exploring the limits of the kind of knowledge we may acquire of the original cause, and this exploration may be seen as giving rise to Hume's 'liminal natural theology' that is 'highly unorthodox, negative and irreligious'.<sup>68</sup>

If religion is to be founded on the 'principles of reason',<sup>69</sup> as opposed to, say, revelation or innate ideas, then these limitations are especially clear. Talking about God and his properties is talk about existence and matter of fact, and in these questions no *a priori* argument can be successful.<sup>70</sup> Putting revelation on one side, the exploration can only start from the relational characterization of God as the cause of the 'order of nature': 'from the order of the work you infer, that there must have been project and forethought in the workman'. As Hume rightly points out, 'this is an argument drawn from effects to causes',<sup>71</sup> and as such it must conform to the general methodological rules of experimental reasoning.<sup>72</sup> There is nothing special in the methodological requirements set for natural theology: they are continuous with those of natural and moral philosophy in general, and indeed with the rules of everyday reasoning from which they are refined. Hume's experimental method of finding causes derives from a study of everyday causal reasoning and consists in a more conscious, reflective, and sophisticated application of it. The empirical study of everyday causal reasoning is thus the source of the normative canon of cause-searching which provides the 'logic' equally characteristic to reasoning in moral and natural philosophy—and of course, with a lesser degree of precision and rigour, to everyday reasoning too.<sup>73</sup>

In the specific context of evaluating the cognitive limitations of natural theological reasoning Hume invokes a set of such rules. First: 'When we infer

67 Holden T., *The Spectres of False Divinity: Hume's Moral Atheism* (Oxford: 2010) 28.

68 Ibidem 46.

69 Hume, *Enquiry* 11.10.

70 Ibidem 4.1–13, 12.28–29.

71 Ibidem 11.11.

72 For a detailed discussion see Demeter, "Hume's Experimental Method".

73 See Serjeantson R., "Hume's General Rules and the 'Chief Business of Philosophers'" in Frasca-Spada M. – Kail P.J.E. (eds.), *Impressions of Hume* (Oxford: 2005) 187–212.

any particular cause from an effect, we must proportion the one to the other, and can never be allowed to ascribe to the cause any qualities, but what are exactly sufficient to produce the effect'.<sup>74</sup> This is a rule equally applicable while exploring the properties of 'brute unconscious matter, or a rational intelligent being'.<sup>75</sup> The practical consequence of this rule is that no property, intention, or motivation can be legitimately ascribed to the original cause that is not required to explain the effects, i.e. the universe. Therefore, it is implied, the traditional properties of the Christian God, like perfect goodness, omniscience, omnipresence, omnipotence etc., cannot be vindicated on the basis of natural theology, because the world should look quite different if the original cause had all these attributes. Albeit an inference is possible here, it is insufficient to satisfy the aspirations of a Christian natural theology.

Secondly and consequently, the method of analysis and synthesis, which Hume almost explicitly endorses as the universal method of natural and moral philosophies, can have only limited use in religious contexts:<sup>76</sup>

We can never be allowed to mount up from the universe, the effect, to Jupiter, the cause; and then descend downwards, to infer any new effect from that cause [...] The knowledge of the cause being derived solely from the effect, they must be exactly adjusted to each other; and the one can never refer to anything farther, or be the foundation of any new inference and conclusion.<sup>77</sup>

Although the exact terms do not figure here, in contemporary usage the terms 'mounting up' and 'descending' belong to the same family of concepts as 'analysis' and 'synthesis'. Those were applied to the search for causes—and this is indeed the case with Hume's usage as well.<sup>78</sup> The lesson Hume provides here is that analyzing causes from effects cannot proceed arbitrarily. And particularly, we cannot analyze phenomena into the characteristics of some deity. What we can do is to collect relevant phenomena, find analogies between them and ascribe those analogies to similar causes, thereby reducing a variety of phenomena to regular principles which underlie them, and making the principles

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<sup>74</sup> Hume, *Enquiry* 11.12.

<sup>75</sup> Ibidem 11.13.

<sup>76</sup> See Hume, *Enquiry* 8.7–9. For a detailed discussion see Demeter, "Liberty, Necessity and Hume's 'Science of Man'".

<sup>77</sup> Hume, *Enquiry* 11.14.

<sup>78</sup> See Jardine L., *Francis Bacon and the Art of Discourse* (Cambridge: 1974) 249.

so gained perform explanatory work. But our knowledge cannot in any case transcend what we can infer on an analogical basis from the effects themselves.

Moreover, analysis and synthesis on this analogical basis inevitably break down should they be applied in the context of the exploration of God's intrinsic properties. The problem arises from the uniqueness of the relation between cause and effect in this case. Inference to a cause from its effect is possible only if there is a pool of observations with respect to the specific cause-effect relation, without which the cause could not be revealed by an analysis of the relevant analogies. Only in the case of having relevant analogies at hand can 'we mount from the effect to the cause; and descend [...] again from the cause', because without the support of 'a hundred other experiences and observations [...] this method of argument must be considered as fallacious and sophistical'.<sup>79</sup> There is thus a crucial lack of analogy between studying natural phenomena and studying God, because '[t]he Deity is known to us only by his productions, and is a single being in the universe, not comprehended under any species or genus, from whose experienced attributes or qualities, we can, by analogy, infer any attribute or quality in him'.<sup>80</sup> Consequently, the methodology of experimental reasoning cannot be fruitfully extended to God, precisely because of his uniqueness. And given that we have no other legitimate way to inquire into questions of existence and matters of fact, we simply have no legitimate way to inquire into the properties of the original cause beyond the empty insight that it was sufficient to cause a world like ours. Therefore 'it is impossible for you to know any thing of the cause, but what you have antecedently, not inferred, but discovered to the full, in the effect'.<sup>81</sup>

Thirdly and consequently, what we can in this particular case infer from the effect concerning its cause cannot establish any new explanation of past phenomena or any new prediction of forthcoming events. Hume's argument runs as follows:

If they tell me, that they have mounted on the steps or by the gradual ascent of reason, and by drawing inferences from effects to causes, I still insist, that they have aided the ascent of reason by the wings of imagination; otherwise they could not thus change their manner of inference, and argue from causes to effects; [...] forgetting that they have no reason to

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79 Hume, *Enquiry* 11.25.

80 Ibidem 11.26.

81 Ibidem 11.20. See also 11.26 n.31: 'Let the inferred cause be exactly proportioned (as it should be) to the known effect; and it is impossible that it can possess any qualities, from which new or different effects can be inferred'.

ascribe to these celestial beings any perfection or any attribute, but what can be found in the present world. [...] If you come backward, and arguing from your inferred causes, conclude, that any other fact has existed, or will exist, in the course of nature, which may serve as a fuller display of particular attributes; I must admonish you, that you have departed from the method of reasoning, attached to the present subject, and have certainly added something to the attributes of the cause, beyond what appears in the effect.<sup>82</sup>

Even if an ontological commitment to the original cause cannot be challenged, the enterprise of exploring it through the study of its effect is epistemically infertile because it cannot yield principles for predictive and explanatory success. The experimental method of reasoning can yield no cognitive benefits in this specific case, because we cannot compare various effects and ascribe them to the same cause. We have a unique relation here and we have access only to the effect, and no independent access to its cause—a hopeless epistemic situation.

Hume argues further that taking ourselves as the model of the original cause cannot improve this epistemic situation. We can know from experience the principles which govern human design, inclination, and action, and on the basis of this knowledge we can draw conclusions concerning human conduct. If human intellect had some ‘remote analogy’<sup>83</sup> to that of the ‘Supreme Being’, then there would be a pool of observations necessary for experimental reasoning. However, ‘it must evidently appear contrary to all rules of analogy to reason, from the intentions and projects of men, to those of a Being so different’.<sup>84</sup> Due to the lack of relevant similarities, human intellect cannot serve as an analogue of the original cause adequate for processing by means of experimental reasoning.

Overlooking these limitations of natural theology results in the imagination going wild creating a fictional ‘superlative intelligence and benevolence’ instead of sticking to the only conclusion that reason can provide: ‘Let your gods [...] be suited to the present appearances of nature.’<sup>85</sup> This is the only way natural theology can proceed for Hume, but as we have seen it does not get very far in this way, and it can turn out be ‘liminal natural theology’ at most: a natu-

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82 Ibidem 11.16, 18.

83 One should note that this is quite contrary to what Philo deems plausible in Hume David, *Dialogues concerning Natural Religion* (Cambridge: 2007) 12.7, 33.

84 Hume, *Enquiry* 11.27.

85 Ibidem 11.15.

ral theology that tells us something about what the original cause is not like, but is silent about its intrinsic character. But if Hume's advice is taken, then that prevents us from tormenting ourselves with problems like that of *theodicy*, which arises merely from a 'fruitless industry to account for the ill appearances of nature, and save the honour of the gods; while we must acknowledge the reality of that evil and disorder, with which the world so much abounds'.<sup>86</sup>

As a result of these considerations it is natural to conclude that the traditional programme of natural theology, 'entirely unsupported by any reason or argument, can never be admitted but as mere conjecture and hypothesis'.<sup>87</sup> The religious hypothesis thus turns out to be a hypothesis in the pejorative sense of the term:<sup>88</sup> a knowledge claim unsupported by an analysis of phenomena, and therefore it can be listed among the 'speculative dogmas of religion' that arise from philosophy 'allying with superstition'.<sup>89</sup> By proclaiming natural theology as superstition Hume changes the frame of significance within which meaning can be ascribed to empirical and theoretical findings. In the early modern period an important source of legitimacy of theoretical work that had no practical relevance was that it contributed to the understanding of God.

Hume's challenge questioned this source of legitimacy and he reached a conclusion similar to that offered at the end of Section VIII: reason cannot be extended so as to draw inferences of otherworldly significance. Even if God did write the Book of Nature he did not equip us with the necessary tools of reasoning for reading it that way.

Consequently, Hume implicitly rejects Newton's and the Royal Society's vision concerning the study of God through nature and the enlargement of moral philosophy through our improved knowledge of the first cause. The main lesson Hume offers is that the knowledge we gain from studying the first cause in accordance with sober methodological rules, to which Newton and his followers also assented,<sup>90</sup> is incompatible with claims of transcendent knowledge. So if we are to stick to the only method of experimental reasoning, which is founded on 'experience and observation and analogy'<sup>91</sup> and excludes

86 Ibidem 11.17.

87 Ibidem 11.26.

88 On the various uses of 'hypothesis' and related terms like 'query' and 'conjecture' see Anstey P., "The Methodological Origins of Newton's Queries", *Studies in History and Philosophy of Science* 35 (2004) 247–269.

89 Hume, *Enquiry* 11.3.

90 See Buckle, *Hume's Enlightenment Tract* 284ff. And also Demeter T., "Enlarging the Bounds of Moral Philosophy: Newton's Method and Hume's Science of Man", in Biener Z. – Schliesser E. (eds.), *Newton and Empiricism* (Oxford: 2014) 171–204.

91 Hume, *Enquiry* 11.30.

revelation and innate ideas, we should change the ideology of natural philosophy: its religious frame of significance is to be replaced by an entirely secular one. In this respect, Hume's moral philosophy is certainly not Newtonian.

### The Secular Ideal of Knowledge and Religious Fictionalism

I have emphasized throughout that Hume in these two sections weighs religion on the scale of epistemic value and cognitive reliability. On this scale he finds that revelation fails to report phenomena worthy of investigation, let alone evidence to be relied on, and also that empirical reason does not provide a fruitful way to explore the properties of the original cause. Therefore religion should give up all its knowledge claims, and natural philosophers should give up all their aspirations to reach knowledge of transcendence through the experimental method of reasoning—and there is no other viable way in questions of existence and matters of fact. You cannot have the methods and epistemic standards of natural philosophy *and* reach the conclusions of Christian theism. Knowledge properly so-called can belong exclusively to the secular world.

As we have seen, the edge of Hume's argument in both sections is driven towards those deriving religious belief from 'the principles of human reason',<sup>92</sup> which does not in itself exclude the possibility of putting religious belief on a different footing. And, as we have seen, he indeed suggests that religious belief is rooted in human nature through the functioning of imagination. Having granted this, religious belief may be a miracle, as Hume suggests,<sup>93</sup> by the standards of reason, but it can be accounted for by other principles of human nature, which may suggest that it may have other, non-epistemic functions.<sup>94</sup>

And indeed, while arguing for a secular ideal of knowledge, Hume is not blind to other contexts in which religion may prove to be useful. He contemplates whether religion can have virtues in moral and social respects independently of its poor cognitive performance, and in this context his conclusion is not as straightforward as his epistemic verdict. For the majority of the argument this may not seem to be the case. Section XI starts from the question of whether disputes concerning the origin of the world are 'entirely indifferent to

92 Ibidem 10.40 see also 11.10.

93 Ibidem 10.41.

94 Hume actually gives a quasi-psychological and quasi-sociological account of the origins of religion in Hume D., *The Natural History of Religion in A Dissertation on the Passions; The Natural History of Religion* (Oxford: 2007).

the peace of society'<sup>95</sup> or 'loosen, in a great measure, the ties of morality'.<sup>96</sup> In the course of argument he reaches the conclusion that past experience teaches us that 'in the present order of things, virtue is attended with more peace of mind than vice, and meets with a more favourable reception from the world' and therefore 'every advantage is on' the side of the virtuous course of life. Consequently, there is no need beyond this insight for a 'divine existence' that guarantees 'supreme distributive justice' in order to maintain the order of society. Given that the reasoning that could lead us to the conclusion that there is such a divine existence is fallacious, we have no rational reason to believe in its existence and to conduct our actions according to its alleged instructions.<sup>97</sup>

But this is not Hume's last word on the issue. Even if reason cannot vindicate religious precepts of morality and social conduct, the precepts themselves can be useful:

You conclude, that religious doctrines and reasonings *can* have no influence on life, because they *ought* to have no influence; never considering, that men reason not in the same manner you do, but draw many consequences from the belief of a divine existence, and suppose that the Deity will inflict punishments on vice, and bestow rewards on virtue, beyond what appear in the ordinary course of nature. Whether this reasoning of theirs be just or not, is no matter. Its influence on their life and conduct must still be the same. And those, who attempt to disabuse them of such prejudices, may, for aught I know, be good reasoners, but I cannot allow them to be good citizens and politicians; since they free men from one restraint upon their passions, and make the infringement of the laws of society, in one respect, more easy and secure.<sup>98</sup>

Hume here points out the weakness of the argument that religious considerations can have no influence on our conduct because they have no rational grounding that could provide a compelling reason. People do draw conclusions and make predictions from their 'belief of a divine existence', and even if these are ill founded, they still have an advantageous influence on social conduct. Requiring rational foundations for religion is thus the business of 'dangerous friends and disguised enemies to the Christian religion', as they 'put it to such a

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95 Hume, *Enquiry* 11.9.

96 Ibidem 11.4.

97 Ibidem 11.20.

98 Ibidem 11.28.



trial as it is, by no means, fitted to endure'.<sup>99</sup> The most important consequence of this line of questioning is the removal of breaks and inhibitions that prevent actions harmful to society.

This position can be considered as a form of *religious fictionalism*.<sup>100</sup> It maintains that even if religious teachings are false, their truth-value is not an important property and therefore their cardinal virtue is not epistemic. Rather, their main virtue consists in some other property, namely in their social utility which is reflected in their contribution to the preservation of society. But even if Hume sees the possibility of a fictionalist position, he does not pursue it very far. This may be due to the intrinsic instability of the religious fictionalist position: A fictionalist disregards the truth-value of religious doctrines as probably false, and therefore he cannot believe in them; yet at the same time he requires action as if the doctrines were true. But if the fictionalist position is accepted, then the truth of religion cannot be part of the motivation for acting according to its commandments, and it is hard to see what else could fill the role of truth here if not the lessons drawn from previous experience concerning the advantages of a virtuous course of life. And where religious doctrine is superfluous, past experience takes over its motivating role. Essentially, religious fictionalism boils down to a Pharisaic position: the fictionalist must keep his wisdom to himself, and recommend trust in religion to everyone else in order to ensure the conformity with moral precepts.

Religious fictionalism is thus not an ally of enlightenment: it can preserve the social advantages of religion only if its truth is disguised behind the curtains of theism. Maybe this is one reason why Hume's position is equivocal concerning the non-cognitive uses of religion. On the one hand, there are passages in his *oeuvre* that insist that 'there must be an ecclesiastical order, and a public establishment of religion in every civilized community'.<sup>101</sup> On the other hand, at other places he is clearly sceptical even about the social advantages of religion, and sees the dangers arising from religious zeal and enthusiasm.<sup>102</sup> He goes much further in his letters, for example in the one addressed to Andrew Stuart in 1775, where he claims that if 'all Churches shall be converted into

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99 Ibidem 10.40.

100 On fictionalism in general Rosen G., "Problems in the History of Fictionalism" in Kalderon M.E. (ed.), *Fictionalism in Metaphysics* (Oxford: 2005).

101 Hume, *The History of England* vol. III, 134–135. See also the role Hume ascribes to religion in his essay on the 'Idea of a Perfect Government' in Hume David, *Essays, Moral, Political, and Literary*, ed. E.F. Miller (Indianapolis: 1987) 512–529.

102 Hume's *Dialogues concerning Natural Religion* offer a more radical and general critique of religion.



Riding Schools, Manufactories, Tennis Courts or Playhouses', it will contribute to 'our Prosperity'.<sup>103</sup> But in the epistemological context of the *Enquiry* he merely touches upon these issues.<sup>104</sup>

Exploring Hume's attitude toward religious fictionalism would transcend the limits of the present paper. What is more important in the present context for a secular ideology of epistemology is that religious fictionalism concedes the cognitive defeat of both revealed and natural religion, and can at most make an instable attempt to save the social advantages of religion. The lesson Hume provides is clear: the failure of religion to meet the epistemic standards of experimental reasoning suggests that it cannot be taken seriously as a system cognitively competitive with natural and moral philosophies. So, whatever other advantages it may have, they must be independent from its epistemic performance.

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103 See the Appendix attached to Baumstark M., "The End of Empire and the Death of Religion" in Savage R. (ed.), *Philosophy and Religion in Enlightenment Britain* (Oxford: 2012) 256–257.

104 See Hume, *Enquiry* 10.17, 11.29.

# The Problem of Parallels as a Protestant Issue in Late Eighteenth-Century Hungary

*János Tanács*

## Summary

The paper presents a mathematical problem that intersects with intertwined religious and political values and conflicts.\* The problem of parallel lines, which led to the creation and formation of non-Euclidean geometries, is shown to suit the denominational-political expectations and values of the Protestant intellectual milieu at the end of the eighteenth century, while there was no place for the mathematical problem in the Catholic parts of the Hungarian Kingdom. Complex and conflicting social values played a formative role, determining indirectly but decisively which was the receptive environment for this major mathematical breakthrough. This paper suggests that the two value-systems set the boundaries for both the positive and the negative reception of the problem at that time. The disputed question of parallels conforms to complex social expectations and values, and these determined, indirectly but formatively, what was or was not a relevant and significant mathematical problem. Contrary to the received view, there was no general interest in the problem as such in the second half of the eighteenth century, nor did even the leading mathematical school of the period appreciate it. Only a specific segment of the striving Protestant intellectual milieu, mostly German-speaking mathematicians in a marginal position, considered it relevant. Consequently, this paper offers a radically new narrative, suggesting that the Problem of Parallels was not merely a mathematical question philosophically motivated by Kant's ideas, but that it was deeply embedded in the German-speaking Protestant intellectual milieu.

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## Introduction

In this paper, I examine indirect but determining religious, confessional, political, philosophical, and educational factors which played a role in mathematicians' engagement with the Problem of Parallels at the end of the eighteenth century in Hungary. These will show the hidden but formative effect of intertwined religious and political values, which determined the relevance and the importance of the problem for János Bolyai, son of Farkas, whose contribution is central in the creation of non-Euclidean geometry. Farkas Bolyai was already engaged with the question, so I begin by discussing the factors which played a role in the family predilection for parallel lines.<sup>1</sup>

The long-lasting historical process which eventually resulted in the creation and formation of non-Euclidean geometry in the 1830s is usually referred to as mathematical work on the Problem of Parallels (or the Theory of Parallels). In this process, some attempts focused on the conceptual side of the question, trying to clarify the conception of parallelism: i.e. how the co-planar non-secant straight lines would continue if they were extended infinitely. Others concentrated on the demonstrational side of the difficulty. They aimed to clarify the exact status of the so-called Parallel Postulate of Euclid.<sup>2</sup> This latter question focused on the identification of whether the Parallel Postulate (the Fifth Postulate) was an axiom similar to Euclid's other axioms or if it was a theorem which could be deduced from the other axioms and postulates (called the residual system of axioms). In some cases, attempts were made to replace the Parallel Postulate by a simpler and more plausible mathematical proposition than the original. In these cases, the simplicity and the plausibility of the proposed substitution, compared to the original, was disputed and finally cast in doubt. The problem was finally resolved by János Bolyai, and independently by Nikolai Ivanovich Lobachevskii.

As the Problem of Parallels acquired relevance and significance for János Bolyai through his father Farkas, it is obviously interesting to look at the factors that played a role in Farkas Bolyai's engagement with the question. The literature on the history of the Problem of Parallels supports the view that there was consistent general interest in the problem until the discovery of the Bolyai-Lobachevskii non-Euclidean geometries, and that Immanuel Kant's

1 Boyer C.A., *A History of Mathematics* (New York: 1968) 585–588; Gray J., *János Bolyai, Non-Euclidean Geometry, and the Nature of Space* (Cambridge, MA: 2004) 43–49.

2 Gray, *János Bolyai, Non-Euclidean Geometry, and the Nature of Space* 17–32; Eves H., *Foundations and Fundamental Concepts of Mathematics* (Boston: 1997) 51–60; Kárteszi F., *János Bolyai. Appendix: The Theory of Space* (Budapest: 1987) 14–18.

metaphysical ideas concerning the status of geometrical space intensified the quest.<sup>3</sup>

I will show that there was no general interest as such in the problem in the second half of the eighteenth century, yet it was central to a specific segment of the mathematical community. While the problem was neglected in that period by the mathematical community as a whole, as well as by the leading school of that time, namely the French geometrical school, the German-speaking area developed a notable appreciation for it. The Problem of Parallels thus appears to be a question which was not exclusively motivated by the works of Immanuel Kant, but which was deeply embedded in a wider context. This allows us to entertain a hypothesis which is meant to delimit this wider context using a feature other than the obvious linguistic one. According to this hypothesis, the German-speaking *Protestant* intellectual milieu inflected the Theory of Parallels at the end of the eighteenth century, and the Problem was an only locally relevant, but nonetheless philosophically motivated mathematical question for a specific community which held a marginal position and belonged to the German-speaking *Protestant* intellectual sphere. The contrast in the attitudes towards the Theory of Parallels which can be described—at first sight—as an opposition between the attention devoted to it in the intellectual sphere of the striving German mathematicians *versus* the neglect of the leading French mathematical school, implies a deeper, confessional difference.

The phenomenon of confessional embeddedness will take on sharper contours when we examine the complex denominational, political, philosophical, and educational peculiarities of the Kingdom of Hungary at the end of eighteenth century. It emerges that opposition between Hungarian Catholics and Protestants on both denominational and political levels was built into their philosophical attitude towards Kant's ideas, determining the resistance or the acceptance of them by Catholics or Protestants. The denominationally

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3 It is worth comparing this phenomenon to the literature which is deals with János Bolyai's definition of parallelism in the first paragraph of his *Appendix* (1831/1832). While a careful examination of the readings of the first paragraph of Bolyai's *Appendix* discloses remarkable differences in the opinions of historians of mathematics on what can be found in it, and how Bolyai defines parallelism in his work, the differences were not explicitly discussed in the literature till 2009. There was no debate; meanwhile the prevailing historical view seemed to comprise a set of incompatible opinions. See Tanács J., "Grasping the Conceptual Difference Between János Bolyai's and Lobachevskii's Notion of Non-Euclidean Parallelism", *Archive for the History of Exact Sciences* 63, 5 (2009) 537–552. This so-called Received View did not merely determine interpretation of János Bolyai's notion of non-Euclidean parallelism, but also adulterated the different translations of the *Appendix*.

and politically divided Kingdom of Hungary and Transylvania, as part of the Habsburg Empire, constrained the intellectual milieu of Hungarian Catholics, who correspondingly addressed neither Kant's ideas nor the Theory of Parallels, while the intertwining of confessional and political opposition added fuel to the flame for the Hungarian Protestants in advocating Kant's ideas. While these social factors played a role in escalating the speed of reception and transmission of Kant's philosophy in the Hungarian Protestant milieu, they at the same time barred Kant's philosophical thought from Hungarian Catholics.

The serious asymmetry in higher educational content as well as opportunities of the different confessional communities in the Kingdom of Hungary also determined whether Kant and the Problem of Parallels were or were not relevant to a mathematician or philosopher in the Hungarian region. The denominational and political circumstances created peculiar educational conditions and resulted in important differences in experience, like the fact that Hungarian Catholic students attended higher education institutions within the Habsburg Empire, and thus remained within a region where they were neither (or hardly) exposed to Kant's ideas, nor to the Problem of Parallels. Contrary to this, the lack of higher educational opportunities forced peregrinations by Hungarian Protestant students to foreign Protestant universities, colleges, and academies.

In the Kingdom of Hungary, Farkas Bolyai was exposed almost exclusively to Kant's moral and ethical ideas, but not to the philosophically motivated mathematical question of parallel lines. The forced peregrination of the Hungarian Protestant students functioned as a vehicle, taking Farkas Bolyai out of the Kingdom of Hungary, where the Problem of Parallels could scarcely have acquired relevance to him. The peregrination transported Farkas Bolyai into a milieu where the Problem of Parallels was not merely a philosophically motivated, but a relevant and significant mathematical question.

By and large, it was thus a confessionally as well as politically determined complex process which resulted in the fact that Farkas Bolyai, as a Protestant student, found his way into the German-speaking Protestant intellectual milieu in which the Kant-motivated mathematical question could gain relevance and significance for him.

### **Historical Narratives: The Problem of Parallels at the End of the Eighteenth Century**

Just as Farkas and János Bolyai, as the creators of non-Euclidean geometry, portrayed themselves as martyrs and thus generated a tragic narrative of its

origins,<sup>4</sup> so the history of the Problem of Parallels tells a widespread and dominant narrative about the outstanding relevance and significance of the problem throughout history, until non-Euclidean geometry was created. In this narrative, the Problem of Parallels was a universal mathematical question throughout the development of history. Furthermore, as appreciation of the problem became ever more acute, the importance of its resolution was ever more recognized. András Prékopa makes the most explicit claim:

It was also high time to clarify the axiom of parallels. The scientific world awaited an elegant proof of the statement, i.e., they expected somebody to deduce it from the other axioms. However, something quite different happened. The most brilliant chapter in the history of mathematics in modern times began, and it was shown that what the overwhelming majority of people had expected was impossible. The Hungarian János Bolyai and the Russian Nikolai Ivanovich Lobachevskii achieved the breakthrough.<sup>5</sup>

The claim of universality suggests that there were no temporal and spatial differences in the positive reception of the Problem of Parallels: every relevant mathematical community throughout history appreciated the problem. The claim of universality can often be grasped in the expert literature by means of emphasizing the significance of the difficulty without making temporal or spatial restrictions: 'Before the discovery of János Bolyai mathematicians expected a genius to come who would prove postulate v brilliantly, relying on other axioms.'<sup>6</sup> Other scholarly narratives may not be explicit regarding universality, but they can be tailored to fit it well. Such narratives refer to the excellence and to the great number of the mathematicians who tried to solve the problem in order to foreground the time-independent significance of the question. According to Eves 'many reputable geometers attempted over a period of some twenty centuries either to prove it [the Parallel Postulate—J.T.] as a theorem

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4 Alexander A.R., "Tragic Mathematics: Romantic Narratives and the Refounding of Mathematics in the Early Nineteenth Century", *Isis* 97 (2006) 714–726; Gray, *János Bolyai, Non-Euclidean Geometry, and the Nature of Space* 51–52.

5 Prékopa A., "The revolution of János Bolyai", in Prékopa A. – Molnár E. (eds.), *Non-Euclidean Geometries: János Bolyai Memorial Volume* (New York: 2005) 9.

6 Prékopa A., "The revolution of János Bolyai", in Horányi K. – Mázi B. – Rozsondai M. (eds.), *Scientia spatii. The János Bolyai Homepage of the Library of the Hungarian Academy of Sciences* (Budapest: 2009); Weszely T., *János Bolyai. Die ersten 200 Jahre*, (Basel: 2013) 53–59.

or to replace it by a more acceptable equivalent'.<sup>7</sup> Similarly, 'in spite of the considerable effort exerted over a long period of time, no one was able to find' a proper solution.<sup>8</sup> Morris Kline similarly states that '[o]ver two thousand years many dozens of major mathematicians, to say nothing of minor ones, engaged in both types of effort [namely replacement or deduction—J.T.]'.<sup>9</sup> In some cases, the cumulative history of the problem<sup>10</sup> or its continuity is underlined:

Almost from the very moment when the *Elements* [of Euclid—J.T.] appeared until the nineteenth century (over two thousand years!) this axiom continually aroused opposition and many attempts were made to rid geometry of it. There is something moving in the epic of these heroic strivings towards ideal scientific perfection—disinterested effort directed solely by the love of knowledge.<sup>11</sup>

In some cases, an author advocates universality in a somewhat contradictory form. Roberto Bonola in a famous work supports a narrative that concurs with the universality claim: 'The critical study of the Theory of Parallels, which had already led to results of great interest in Italy and Germany, also made a remarkable advance in France towards the end of the 18th Century and the beginning of the 19th'.<sup>12</sup> But according to Bonola, in contrast to Prékopa, it was not the positive solution of the Problem of Parallels—deducing the fifth postulate from the residual system of axioms or finding a contradiction when pursuing the logical consequences of its negation—that was expected. Rather, 'the conviction began to be formed in the second half of the eighteenth century

7 Eves H., *Foundations and Fundamental Concepts* 51. See also ibidem 53. Similarly, Attila Kálmán also underlines the greatness of the numerous mathematicians who attacked the question. See Kálmán A., *The Elements of Non-Euclidean Geometries* (Budapest: 1989) 38.

8 Eves, *Foundations and Fundamental Concepts of Mathematics* 60. Similarly, according to Greenberg, '[f]or over two thousand years some of the best mathematicians tried to prove Euclid's fifth postulate'. Greenberg M.J., *Euclidean and Non-Euclidean Geometries: Development and History* (San Francisco: 1980) 120. See also ibidem 18, 127.

9 Kline M., *Mathematics: The Loss of Certainty* (New York: 1980) 79.

10 Kline argues that '[n]o major branch of mathematics or even a major specific result is the work of a man. At best some decisive step or assertion may be credited to an individual. This cumulative development of mathematics certainly applies to non-Euclidean geometry'—Kline, *Mathematics* 84.

11 Kulczycki S., *Non-Euclidean Geometry. International Series of Monographs on Pure and Applied Mathematics* 16, trans. S. Knapowski (Oxford – Warsaw: 1961) 39.

12 Bonola R., *Non-Euclidean Geometry: A Critical and Historical Study of its Developments* (New York: 1955) 51–52.



that it would be necessary to admit the Euclidean Postulate, or some other equivalent postulate, without proof'.<sup>13</sup> This latter rather suggests the resignation of the geometers, rather than a conviction that an adequate solution could be found.

Another group of such narratives deals with the effect of Immanuel Kant's philosophy. The fact that Kant's *Critique of Pure Reason* played some role in the historical development of the Theory of Parallels is a commonplace of the expert literature.<sup>14</sup> These narratives frequently underline Kant's obstructive influence in the process of the creation of non-Euclidean geometry.<sup>15</sup> According to Bonola, '[h]ow difficult [...] this advance towards the new order of ideas [was] will be clear to any one who carries himself back to that period, and remembers the trend of the Kantian Philosophy, then predominant'.<sup>16</sup> There are cases when Kant's role is evaluated in a somewhat contradictory form. Ferenc Kárteszi admits that controversies about Kant's philosophy played a serious role in the 'rapid increase of the interest in a question [which had been] open for two thousand years',<sup>17</sup> while on the other hand, he qualifies Kant's metaphysical ideas about the status of the geometrical space as a false and obstructive idea from which the fifth postulate had to free itself,<sup>18</sup> as if he cannot decide whether the motivating role of Kant's idea or its obstructive effect should be considered more important. Similarly, he argues that '[t]he strong and lasting effect of Kant's *Kritik der reinen Vernunft* (1781) revived the pursuit of the foundations of geometry and, in particular, the study of the theory of parallel lines'.<sup>19</sup> On the other hand, however,

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13 Bonola, *Non-Euclidean Geometry* 80.

14 Gray J., *Ideas of Space: Euclidean, Non-Euclidean, and Relativistic* (Oxford: 1979) 64; Kárteszi, *János Bolyai* 19.

15 Bonola, *Non-Euclidean Geometry* 64, 92, 121; Eves, *Foundations and Fundamental Concepts of Mathematics* 68; Kulczycki, *Non-Euclidean Geometry* 156–157.

16 Bonola, *Non-Euclidean Geometry* 64. See also 92. In relation to the acceptance of the non-Euclidean geometry Bonola argues that it was delayed by, among other things, '[...] the Kantian conception of space which was then in the ascendant'. Bonola, *Non-Euclidean Geometry* 121.

17 Kárteszi, *János Bolyai* 15. Kárteszi seems to argue that, at least implicitly, there was a temporally salient increase in the number of works dealing with the problem after 1760 until the end of the eighteenth century, compared to the number of works which appeared before that time. Interestingly, without giving any further reference or historical evidence, he places the start of the increase of the interest as well as of the controversies about Kant's philosophy around 1760.

18 Kárteszi, *János Bolyai* 19.

19 Ibidem.



[e]ven the contemporary philosophers knew that the theses of Kant's philosophy relating to the concept of space call for defence. [...] Even the considerations of Gauss and Farkas Bolyai were initially influenced by this false opinion and only later they got free from the Kantian ideas.<sup>20</sup>

Kline considers both aspects of Kant's stimulus:

Kant's doctrines and influence had both a liberating and a restricting effect. By emphasizing the power of the mind to organize experiences in a world we shall never truly know, he paved the way for new structures contrary to those so firmly maintained in his time. But by insisting that the mind necessarily organizes spatial sensations in accordance with the laws of Euclidean geometry he hindered the acceptance of any contrary views.<sup>21</sup>

However, these narratives implicitly admit Kant's stimulus in escalating interest in the Problem of Parallels, implying that it was a metaphysically motivated mathematical question. Nonetheless, Kárteszi's 'rapid increase of the interest' suggests that the relevance and significance of the question was temporally and spatially dependent, rather than its context-independent universality. So Kant's role in the history of mathematics is thus considered as a fact or truism, without investigating its consequences concerning the claim of the universality of concern with the Problem of Parallels. Furthermore, as far as I know, it has not been contrasted to other accounts in the scholarly literature, which, interestingly enough, bring to the fore the French lack of interest. As Jeremy Gray claims, the leading French mathematical school's disregard for the problem at the end of the eighteenth century is clear.<sup>22</sup> This is exactly the historical fact which raises a question for the claim of the context-independent universality of the Theory of Parallels.

The intersection of these two facts, namely Kant's role as a stimulus and the dominant French mathematical school's notable lack of interest in the Problem of Parallels has not hitherto been investigated. With this in mind, I will first examine the third group of narratives to outline the broader context showing that there was no general scientific interest in the Problem of Parallels at the end of the eighteenth century. In contrast, I will argue that the problem attracted exceptional interest only within a particular mathematical

<sup>20</sup> Ibidem.

<sup>21</sup> Kline, *Mathematics* 77.

<sup>22</sup> Gray, *Ideas of Space* 69.

community. I will offer evidence that suggests the elevated interest was due to the ideas of Immanuel Kant for the particular mathematicians who mostly belonged to the German-speaking Protestant intellectual milieu.

### The French Mathematical School c. 1800: Neglecting the Theory of Parallels

First, the somewhat contradictory or paradoxical content of the following two claims is worth bringing to the surface. On the one hand, French geometers were responsible for many remarkable advances in their discipline by the century's end, while, on the other hand, these same geometers completely neglected the Problem of Parallels. The historical evidence would seem to support the latter opinion.

According to Boyer, 'the leading mathematicians during the French Revolution had been, almost without exception, French, but with the beginning of the nineteenth century France again had to share honors with other lands'.<sup>23</sup> From the death of Euler (1783) through the early nineteenth century the French mathematical school was not merely vigorous but essentially dominated the discipline.<sup>24</sup> The weakening or cessation of French hegemony early in the nineteenth century does not signify any absolute decline in the French mathematical school before around 1830.<sup>25</sup> Interestingly enough, 'the powerful French school of mathematics contributed to every branch of the subject' at that time, but 'the only problem which seems not to have interested them significantly was the Problem of Parallels'.<sup>26</sup> The branch of mathematics in which the French mathematicians were particularly successful was synthetic (projective) geometry. Projective geometry is closely connected to the concept of parallelism and infinity: it deals with the method of collineation, i.e., with parallel projection and the ideal elements of space at infinity. So one cannot argue, in the dominant French case, that projective geometry did not appreciate of the Problem of Parallels because it was not relevant to its concerns. If a mathematical problem like the Problem of Parallels were determined merely internally, then the kinds of conceptual connections that are provided by col-

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23 Boyer, *History of Mathematics* 544.

24 Gray, *Ideas of Space* 69.

25 Grattan-Guinness I., "Mathematical Physics in France, 1800–1840: Knowledge, Activity, and History", in Dauben J.W. (ed.): *Mathematical Perspectives. Essays on Mathematics and Its Historical Development* (New York: 1981) 120.

26 Gray, *Ideas of Space* 69.

lineation and ideal elements should be sufficient to entail its appreciation. In sum, projective geometry was not isolated from concepts considered problematic by the Theory of Parallels.

Boyer considers L.N. Carnot, Condorcet, Lagrange, Laplace, Legendre, and Monge to be the leading figures of the French mathematical revolution.<sup>27</sup> Carnot and Monge in particular contributed to projective geometry. This group can be supplemented by the following projective geometers: Charles Julien Brianchon (1783–1864), Jean-Victor Poncelet (1788–1867), Joseph Diaz Gergonne (1771–1859), and Michel Chasles (1793–1880).

With the exception of Legendre and Carnot, none of these figures had anything to say about the Problem of Parallels. This is in keeping with the very detailed historical description by Rosenfeld's exhaustive work. When Rosenfeld describes the historical process resulting in the formation of Bolyai-Lobachevskii non-Euclidean geometry, none of these same geometers (save for Legendre) appear.<sup>28</sup> And *vice versa*: where Rosenfeld discusses the mathematical work of these French mathematicians, neither the Theory of Parallels nor the formation of the non-Euclidean geometry is mentioned.<sup>29</sup> This is similar to what Boyer claims in relation to the mathematical developments in the first half of the nineteenth century:

It has been difficult to present a picture of geometrical developments in the first half of the nineteenth century because of the crosscurrents and interrelations of the multifarious aspects of the subject, but there was one aspect, the rise of non-Euclidean geometry, that developed independently of the movements described.<sup>30</sup>

Boyer describes the area of non-Euclidean geometry developing independently, but he does not explore why it happened this way. Houzel also claims that the creation of projective geometry was 'independent, but contemporaneous to that of the non-Euclidean geometry'.<sup>31</sup> He offers a kind of schematic

<sup>27</sup> Boyer, *History of Mathematics* 544.

<sup>28</sup> Rosenfeld B.A., *A History of Non-Euclidean Geometry: Evolution of the Concept of a Geometric Space* (New York: 1988) 35–109, 206–246.

<sup>29</sup> For Rosenfeld's discussion of Carnot, Monge and Poncelet see Rosenfeld, *History of Non-Euclidean Geometry* 147–150. The others are discussed sparsely but without reference to the theory of parallels.

<sup>30</sup> Boyer, *History of Mathematics* 585.

<sup>31</sup> Houzel C., "The Birth of Non-Euclidean Geometry", in Boi L. – Flament D. – Salankis J.M. (eds.), *1830–1930: A Century of Geometry. Epistemology, History and Mathematics* (Berlin: 1992) 4.

and implicit answer to interpret this historical fact, however: one point of view, 'pure Geometry was relegated in a marginal position in the mathematical framework' of that time, and another point of view 'only the needs of engineers gave again some life to geometry, with Monge, L. Carnot and Poncelet'.<sup>32</sup> This interpretation brings to view a new contrast: pure mathematics or pure geometry seems here to be up against the engineering-oriented geometry of French mathematicians.

In light of this evidence, the image of a broad reception of the Problem of Parallels seems far from clear. The dominant French geometers neglected the problem. These facts also cannot support the view that the mathematical community as a whole expected a positive solution to the problem. The neglect of the problem by French geometers brings into relief the specificity of the interest demonstrated by certain other geometers, whether motivated by Kant's idea of space or some other factor. Having delimited the negative case of the incurious mathematicians, let us now turn to the question of how interest in the problem might be positively circumscribed.

### Escalation of Interest in the Problem of Parallels in the Second Half of the Eighteenth Century

Statistics assembled more than a century ago by Viktor Bobynin yielded valuable information concerning the spatial and temporal distribution of works dealing with the Theory of Parallels before 1800. Though they have since fallen into relative obscurity, Bobynin's statistics contain important data that go beyond the familiar leading indicators of the growing interest in the problem.<sup>33</sup> His statistical analysis can serve as a starting point for our investigation of the social embeddedness of the problem. The data gathered by Bobynin brought to the surface some surprising correlations.<sup>34</sup> 55 works were written about the Problem of Parallels from the time of Euclid's *Elements* until 1759. A further 67 mathematical works dealt with the question from 1760 till 1800. These data suggest renewed activity after 1760. The regional distribution of the works written between 1760 and 1800 is as follows: 44 works in the German lands, seven each in France and Italy, four in England, two in Russia, and one each in Sweden, Switzerland, and the Netherlands. So the data suggest an increase of

<sup>32</sup> Ibidem.

<sup>33</sup> The leading indicators were cited by Kárteszi without reference to Bobynin.

<sup>34</sup> Bobynin V.V., "Elementare Geometrie", in Cantor M. (ed.), *Vorlesungen über die Geschichte der Mathematik* (Leipzig: 1908) 388–389.

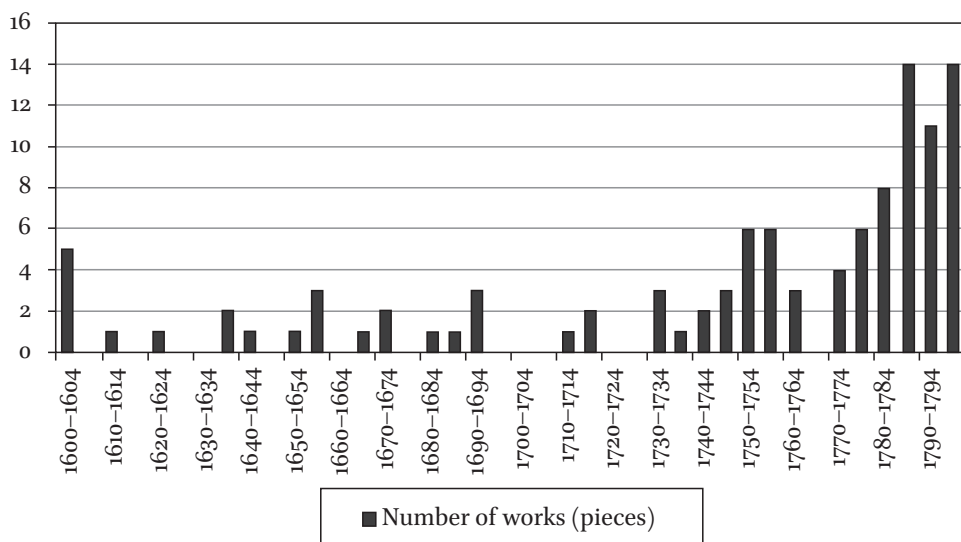


FIGURE 8.1 The temporal distribution of the works dealing with the Problem of Parallels between 1600 and 1799.

interest both temporally after approximately 1760, and regionally connected to the German-speaking lands. Bobynin himself did not investigate the dynamics after 1760. Re-analysis of Bobynins's data, supplemented by a review of the bibliography published by Friedrich Engel and Paul Stäckel, brings out some interesting and informative phenomena.<sup>35</sup> First, time-series analysis suggests that there were two waves of interest in the Problem of Parallels: the first around the middle of the eighteenth century, the second following it after 1780 [Fig. 8.1]. A second observation might suggest that the increase in the number of works dealing with the problem seems to correlate with the appearance of Kant's influential *Critic of Pure Reason* (*CPR*). But these two observations allow a third and surprising one. Beyond Kant's readily identifiable and salient influence after 1781, the second wave started before the appearance of *CPR*. It suggests that Kant's impact was superimposed on a prior existing interest, and in turn intensified it. In the light of this dynamics, the Problem of Parallels really seems to be a Kant-motivated mathematical question inflected by the German-speaking area at the end of the eighteenth century.

35 Engel P. – Stäckel P., *Die Theorie der Parallellinien von Euklid bis auf Gauss. Eine Urkundensammlung zur Vorgeschichte der nichteuklidischen Geometrie, herausgegeben in Gemeinschaft mit F. Engel* (Leipzig: 1895) 293–313.

In light of French neglect, the increased interest in the German-speaking lands shows a significant asymmetry. The two components of the asymmetry, namely the temporal one showing the cumulative interest in the problem and the regional one showing the embeddedness of the question in a given language community, can be supplemented by a further factor, according to the hypothesis of Imre Toth. Toth claims that the escalating interest in the Theory of Parallels was embedded deeper in contemporary religious or denominational conditions than mere linguistic correlations might suggest.<sup>36</sup> According to this hypothesis, the elevated interest was due to particular mathematicians who mostly belonged to the German-speaking Protestant intellectual milieu. To put it differently, the Problem of Parallels was a mathematical question motivated by Kant, but socially deeply embedded in the German-speaking Protestant intellectual circles. Until recently, this served more as a hypothesis than as a robustly developed argument. I claim that this phenomenon of the denominational embeddedness will take on sharper contours when we examine the complex denominational, political, philosophical and educational peculiarities of the Kingdom of Hungary at the end of eighteenth century.

However, in the following sections, I will demonstrate that there was no way for the Hungarian Catholic community to embrace the Problem of Parallels due to the religious and political peculiarities of the Hungarian Kingdom at the end of the eighteenth century. I will thereby show that the question could only really become relevant in the Protestant community. This will bring to the surface how political and denominational factors could interfere both positively and negatively with appreciation of the mathematical problem. Due to their resonance, political and denominational factors could determine the reception of the problem in a mediated but definite fashion.

### The Reception of Kant's Idea and of the Problem of Parallel in the Kingdom of Hungary at the End of the Eighteenth Century

In the vast literature on the history of Hungarian philosophy, there are two historical commonplaces, and surprisingly enough they have not been juxtaposed or intertwined, so mutual inferences have not been drawn. The first posits the nearly exclusively Protestant reception of Kant's thought in Hungary.<sup>37</sup> The

36 Toth I., "Gott und Geometrie: Eine viktorianische Kontroverse", in Henrich D., *Evolutionstheorie und ihre Evolution* (Regensburg: 1982) 160–162.

37 Bartók G., "Kant és a protestántizmus", *Protestáns Szemle* 5–6 (1924) 277; Fehér M.I., "Polgári kultúra, polgári műveltség, polgári filozófia: Kant és a neokantianizmus világszemlélete", *Protestáns Szemle* 2 (2002) 103.

second advocates the strong Kantianism of Farkas Bolyai.<sup>38</sup> Since we know that Bolyai was a member of the Reformed Church, the two are surely compatible. But delving into the details lets us arrive at a stronger conclusion. Permit me to state it in counterfactual form: if Bolyai had been a Catholic in Hungary at the end of the eighteenth century, then he would have had scarcely any chance of acquainting himself with the ideas of Kant and, by extension, the Problem of Parallels. Let us consider the historical evidence in support of this claim.

Kant initially found both Protestant and Catholic readers in Hungary. The Bavarian Johann Delling, who taught at the Academy of Law in Pécs, entertained ambitions of cultivating Kantian philosophy. Anton Kreil, a professor at the University of Pest, likewise propagated Kantian philosophy. That both men were Catholic was at first no obstacle to their efforts. But it was not long before the Governor's Royal Council enacted legislation in June 1795 prohibiting the teaching of Kantian philosophy in all Catholic schools.<sup>39</sup> This confessionally-motivated reaction against Kantian concepts acquired a political dimension: from that time onward the spreading of Kant's ideas was regarded as political activity, indeed subversion. Any person 'who desires to study Kant, wants to teach in Kant's spirit, wishes to translate Kantian work, considers himself a follower of Kant, or merely falls under suspicion of these things' had to reckon with the possibility that 'his behaviour qualifies as political provocation'.<sup>40</sup> As a consequence both Delling and Kreil lost their positions. Thenceforward adopting Kantian sensibilities was never merely philosophical, but always carried the risk of political consequences. Since the opposition between Catholics and Protestants was not exclusively a denominational conflict at that time in the Kingdom of Hungary, the politics could never be excluded. That is why the Royal Council legislation protecting Catholics from the scourge of Kantianism met with a counter-reaction from Protestants who were now motivated to appreciate and propagate the thought of Kant. The reception of Kant's ideas within the Protestant intellectual milieu was thus neither a natural nor a

38 Stackel P., *Wolfgang und Johann Bolyai. Geometrische Untersuchungen* (Leipzig: 1913) 33–34; Szénássy B., *History of Mathematics in Hungary until the 20th Century* (Budapest: 1992) 135–137.

39 Horkay L., "Kant első magyar követői", in Szauder J. – Tarnai A. (eds.) *Irodalom és felvilágosodás. Tanulmányok* (Budapest: 1974) 201. See also Mészáros A., *A filozófia Magyarországon. A kezdetektől a 19. század végéig* (Bratislava: 2000) 98, as well as Percz L., "Felemás portré, politikai keretben. Kant-vita a Tudományos Gyűjtemény 1817–1818-as évfolyamaiban", *Világosság* 11 (1992) 846.

40 My translation—J.T. The Hungarian reads: 'aki Kanttal kíván foglalkozni, kanti szellemben akar tanítani, kantianus műveket óhajt fordítani, Kant-követőnek tartja magát vagy akár csak ezek gyanújába keveredik', annak számolnia kell vele, hogy 'magatartása politikai kihívásnak minősül', and is cited by Percz, "Felemás portré, politikai keretben" 845.



neutral process, but rather one infused with denominational and political feeling. Consequently, the positive reception of Kant's ideas in the Hungarian Kingdom and Transylvania took place almost exclusively inside the Protestant intellectual milieu.

It is worth highlighting the following two phenomena. First, the Hungarian Catholic-Protestant denominational as well as political opposition was built in into the philosophical attitude towards Kant's ideas, determining the resistance or the acceptance of Kant's ideas by the Catholic or Protestant persons. Second, while these social factors played a role in escalating the speed of reception and transmission of Kant's philosophy in the Hungarian Protestant milieu, they also—at the same time—barred Kant's philosophical thoughts from the Hungarian Catholics.

In the 1790s, it was Evangelical and Reformed secondary schools and colleges, predominantly at Pápa, Debrecen, and Marosvásárhely, which provided the specific locales for this reception.<sup>41</sup> These towns were the dominant intellectual centres of the Hungarian-Transylvanian Protestant communities. We know from these educational settings that attention focused almost exclusively on Kant's moral philosophy and largely passed over his speculations concerning the character of space and time. So this *primary* reception almost certainly did not result in Farkas Bolyai being exposed to the Problem of Parallels. Yet this was merely one aspect of the reception of Kant. There is another aspect which did indeed result in Bolyai becoming acquainted with the Problem of Parallels and convinced of its importance. We might characterize this as a second-order phenomenon superimposed on the primary one. This second-order reception process stemmed from Bolyai's scholarly peregrinations. In 1796, he went to Jena, and after that to Göttingen. In Göttingen he studied mathematics and met Karl Friedrich Gauss. Bolyai's interest in and commitment to the Problem of Parallels was prompted by his studies in Göttingen.<sup>42</sup> While this historical fact is well known, it is crucial to appreciate that his mere presence in Gauss's company is itself insufficient to explain what formerly happened, given what we have argued above. What is more important here is that Bolyai's travels were, so to speak, 'coerced'. He found himself in Göttingen as an immediate—if contingent—consequence of the denominational, political, and educational peculiarities of the Hungarian Kingdom at the end of the eighteenth century.

41 Horkay, "Kant első magyar követői" 202–203, 225. See also Mészáros, *A filozófia Magyarországon* 80.

42 Stackel, *Wolfgang und Johann Bolyai* 42–43; Szénássy, *History of Mathematics in Hungary until the 20th Century* 128.



The considerable literature on the Hungarian reception of Kant's ideas tends to take for granted that study abroad by Reformed or Evangelical students played a significant role.<sup>43</sup> Clearly it was not teachers and bookmen from abroad like Dwelling and Kreil who established Kantian thought in Hungary. Rather it was Hungarian Protestant students who had spent time abroad who became his chief advocates. The denominational differences manifested themselves in the destinations of the travellers: Reformed or Evangelical students preferred German, Scandinavian, and English universities as well as Swiss and Dutch academies over French and Italian universities. This trend is more significant than any regional factors that could have played a role in the choice of destinations: regardless of their intra-Protestant denominational differences, Hungarian, Upper-Hungarian, and Transylvanian Protestant students attended higher education institutions in the Protestant regions of Western Europe. In contrast to the wanderings of Protestant students, scarcely any Hungarian Catholic students attended Western European higher education institutions. They studied mostly in the closely monitored higher education institutions of the Habsburg Empire.<sup>44</sup> The reason why the Protestants had to go abroad was the lack of Protestant higher education institutions within the Empire. Since Habsburg universities could easily accommodate Catholic students, there was no compelling reason for them to visit foreign universities, colleges, and academies.

It is worth noting that the same denominational and political factors pushing a certain class of students to go abroad also fed into the reception of Kant's thought. The political and denominational prohibition of Kant prevented Catholics from engaging his thought directly, and the asymmetric institutional 'mapping' of these denominational and political circumstances likewise prevented them from encountering his ideas via secondary routes. On the other side of the divide, these peculiar circumstances motivated Protestants to engage Kantian thought directly, by spreading his ideas in the denominational secondary schools and in the main cities of the Hungarian Protestants, and they further ensured that second-order exposure to the influence of Kant, while studying abroad, would in turn find reinforcement upon return to Hungary.

43 Horkay, "Kant első magyar követői" 201.

44 Mészáros A., "Iskolai filozófia Felső-Magyarországon a 19. században", in Mester B. – Percz L. (eds.) *Közelítések a magyar filozófia történetéhez. Magyarország és a modernitás* (Budapest: 2004) 122–180. See also Szabó M. – Szögi L., *Erdélyi peregrinusok. Erdélyi diákok európai egyetemeken, 1701–1849* (Marosvásárhely: 1998) 9–11, 17–43, and Szögi L., *Magyarországi diákok németországi egyetemeken és főiskolákon, 1789–1919* (Budapest: 2001) 25–35.

It is true that in the Kingdom of Hungary Farkas Bolyai could have been exposed almost exclusively to Kant's moral and ethical philosophical ideas, but not to the metaphysical speculations concerning the status of the geometrical space, nor the Kant-motivated mathematical question of parallel lines. So the forced peregrination of the Hungarian Protestant students functioned as a vehicle, taking Farkas Bolyai out of the Kingdom of Hungary, where the Problem of Parallels could hardly have acquired relevance to him. The peregrination transported Farkas Bolyai into a milieu where the Problem of Parallels was not merely a philosophically motivated, but a relevant and significant mathematical question.

The serious asymmetry in opportunities of the different denominational communities in the Kingdom of Hungary also determined whether Kant and the Problem of Parallels could or could not be relevant to a mathematician in the Hungarian region. The denominational and political circumstances created peculiar educational conditions such that Hungarian Catholic students attended higher education institutions within the Habsburg Empire, and thus remained within a region where they were not (or hardly) exposed to Kant's ideas, nor to the Problem of Parallels. Contrary to this, the lack of higher educational opportunities, as a consequence of the same denominational and political factors, resulted in the historical fact that Farkas Bolyai, as a Protestant student, could find his way into the particular German-speaking Protestant intellectual milieu in which the Kant-motivated mathematical question could gain relevance and significance for him.

### **Conclusions and a New Narrative: The Problem of Parallels as a Protestant Problem in Late Eighteenth-Century Hungary**

There are three dominant views concerning the status of the Problem of Parallels in the eighteenth century. Some writers argue in favour of the universality of the problem. Others note the extra-mathematical influence of Kant's work, but they consider it mostly in negative terms. According to them, Kant played a negative role in the solution of the problem and he thereby hindered the discovery or formation of non-Euclidean geometry. The third view emphasises the asymmetries in the appreciation of the problem among the different mathematical schools. These asymmetries can be mapped in parallel with language communities or correlated with pure mathematical versus engineering-oriented cultivation of the subject. But historians of mathematics have not yet ventured any account making reference to denominational, political, or other 'ideological' factors, which could help explain the sharply

contrary perceptions of the nature of the problem. My claim here is that the Problem of Parallels did not appear to contemporaries as a universal, time- and medium-independent problem during the eighteenth century, and especially not at the end. The Theory of Parallels was profoundly embedded in the German-speaking Protestant milieu. This is readily compatible with advocacy of asymmetries in the forms of reception, but it makes the comparative reference points more specific by identifying deeper religious or denominational factors at work. Thus we get away from drawing general parallels between French-speaking and German-speaking realms, and move to a level where religious or denominational circumstances permit substantive parallels with Western Europe, while at the same time highlighting asymmetries in these comparative mappings. Taken together, this allows us to invert the 'positive' and 'negative' valences initially assumed in our framing of the reception of the Problem of Parallels: if there was indeed virtually no evidence of anyone taking an active interest in the problem—not even among the leading French mathematicians—then we might rather say that any factor that could have played a role in catalysing engagement with the question should be understood as a contributing to its eventual 'positive' solution.

Two further conclusions can be drawn. First, the intertwined religious and political factors can have a shaping force in a fairly mediate way. What I mean by this is that these factors played a determining role, not on the level of explicit rejection of the Problem of Parallels, but at a deeper, latent level, where the associated philosophical problems and ideas of Kant were present. Since these general philosophical problems were scarcely separable from the Protestant intellectual milieu, this determining role can immediately be grasped at this level. Thus the intertwined religious and political factors which constrained the intellectual milieu as favourable or unfavourable nonetheless remained doubly distant from the level of the mathematical problem itself. This might explain why these mediating effects have not been more evident until now. The second interesting phenomenon is closely connected to the first and shows the peculiar situation of the Hungarian Kingdom within the Habsburg Empire and in Central Europe. It is remarkable how clear-cut the effect of the intertwined religious and political factors within the Habsburg Empire was when we compare them to the situation in Western Europe at that time. Yet by the same token, the peculiarity of the Habsburg case prevents any oversimplified comparisons between French Catholics and German Protestants, since the Habsburg array of languages, nations, and denominations defeats any easy parallels. Due to its peculiar circumstances, Central Europe condensed a phenomenon that was somewhat fragmentary and diffused in Western Europe, thereby bringing deeper effects into clearer focus.

It is worth identifying the precise functions of these religious and political factors. On the one hand, these factors constrained the intellectual milieu of Hungarian Catholics, who addressed neither Kant's ideas nor the Theory of Parallels. On the other hand, these factors added fuel to the flame for the Hungarian Protestants to advocate Kant's ideas and played a role in a fairly mediate way in the reception of the Problem of Parallels in the Hungarian Protestant milieu.

It was thus that the complex and conflicting social values played a selective role, determining indirectly but decisively, which could be the receptive medium for the philosophically motivated mathematical question and which could not. Therefore, the two value-systems set the boundaries of both the positive and the negative reception of the problem at that time. This shows the formative effect of the intertwined religious and political values in determining the relevance and a significance of a mathematical problem.

I do not claim that the Problem of Parallels was *exclusively* embedded in Protestantism, but that we can see a very strong tendency along this line at the end of the eighteenth century. Neither do I claim that religious or confessional factors cannot be demonstrated in a more direct way on the upper levels. What I would instead argue is that historians of mathematics have devoted little attention until now to evidence for the presence and effect of religious and political factors as forces constraining the relevance and significance of the Problem of Parallel for a given community of practitioners. In the present case, I see sufficient strong evidence to discern the somewhat mediated but still clear-cut effects of these factors. In sum, these permit us to formulate a hypothesis according to which subsequent investigations may yet demonstrate the religious or denominational embeddedness of the Problem of Parallels in a more direct way in the upper levels of the problem or in the context of Western-European mathematics at the second half of the eighteenth century.

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## *Values in Controversy*







# Newton's Strategic Manoeuvring with Simple Colours, Categories, and Descriptions

*Gábor Áron Zemplén*<sup>1</sup>

## Summary

Experiments with prisms played an important role in natural philosophical inquiries about the emergence of colours in the seventeenth century, and the mathematization of colour was a focal problem. This paper offers a radical historical interpretation of Newton's 1671–1672 'New Theory' and the optical controversy that followed the publication, proposing that the 'New Theory' was composed in a way that would minimize the possibility of rejection and defend its position from refutation by claiming the status of demonstration. Queries and challenges to Newton and his progressive explication of the theory helped contemporaries to raise criticism, which, in turn, helped Newton to readjust the scope of his revolutionary optical enterprise. By demonstrating that only he himself held the key to the discovery, Newton presented a form that successfully maximized ethos and social credit. The 'Newtonian method' played an important role in pre-empting criticisms locally, in the respective (heterogeneous) discourse community. The vagueness of Proposition 5 of Newton's theory or the gradually explicated description of his experimental set-up suggest that for some 'Propositions' the propositional content is (deliberately) unclear, vague, and negotiable, and that categories, classifications, or methodological norms shift, change, and are complexly influenced by the textual fabric of debates as they acquire functional roles and relate to immediate argumentative contexts.

**'[T]he Oddest, if Not the Most Considerable, Detection w<sup>ch</sup> hath hitherto Been Made in the Operations of Nature'**

Mathematics had long been envisaged as a language well suited to the study of the natural world, including the mysterious properties of light and illusory

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colour-phenomena. The perspectivists, like early modern natural philosophers, placed optics and the problem of rainbow colours at the centre of enquiries concerning the natural world. Roger Bacon demonstrated the usefulness of geometry in the discussion of the rainbow in his *Opus Majus*,<sup>2</sup> and saw rainbow colours as the *ultimate test* not just of the mathematical approach, but of 'experimental' science.<sup>3</sup> In unison with Bacon, Descartes, and many others, Newton presented a mathematical treatment of rainbow colours as a discovery, and positioned it as an exemplar of his method of research. The first public exposition of his views was announced in a brief letter to Henry Oldenburg, the Secretary of the Royal Society, as a 'New Theory', 'the oddest, if not the most considerable detection w<sup>ch</sup> hath hitherto been made in the operations of Nature'.

Once the letter was published, Newton's peers challenged him with a whole range of objections, forcing him to modify his position and at last partially to ban the publication of the controversy. Newton's first publication of his optical theory in the *Philosophical Transactions* for 19 February 1671–1672 and the ensuing debate was one of the earliest significant controversies in the newly emerging form of publication—the scientific journal.

As J.A. Lohne summarizes,

he coined a new technical term spectrum besides making Hooke's phrase *Experimentum Crucis* well known in the scientific world. [...] Besides being of supreme interest for the history of optics, it has often been held as a model of true scientific method. We may add that the treatise is popularized science at its best with a quite exceptional clarity of exposition.<sup>4</sup>

From the early nineteenth century, this model scientific article has often been studied, but despite its supposed clarity, various, conflicting interpretations are extant. It remains enigmatic: if it was 'exemplary science', and 'exemplary

2 Bacon Roger, *The Opus Majus of Roger Bacon*, trans. and ed. R.B. Burke (Philadelphia: 1928) vol. I, 234–235.

3 The meaning bifurcated, with the gradual separation of connotations (*experientia* vs. *experimentum*). For an account of the semantic shift, see Dear P., *Discipline & Experience: The Mathematical Way in the Scientific Revolution* (Chicago: 1995). Bacon maintains that '[s]ince this Experimental Science is wholly unknown to the rank and file of students, I am therefore unable to convince people of its utility unless at the same time I disclose its excellence and its proper signification. [...] I give as an example the rainbow and phenomena connected with it': Bacon, *Opus Majus of Roger Bacon* vol. II, 587–588.

4 Lohne J.A., "Experimentum Crucis", *Notes and Records of the Royal Society* 23 (1968) 181.

academic writing', why did Newton's contemporaries not simply accept his discovery?

Some historians treat at least some of the critics as incompetent non-experts. Newton received a letter from the Jesuit Linus, who was an 'old fool', Newton's 'bitterest and least intelligent critic'.<sup>5</sup> Just as some blamed the audience for not yielding, some blamed the form of the letter for not conveying the message. As Zev Bechler puts it,

[t]he first paragraph of Newton's 1672 optical paper announced the need for a revolution in optics. Three pages later, the revolution was performed, again in a single short paragraph. The rest of the paper carefully explained that all was over: The revolution was complete [...]. This was bad form. One doesn't just walk in, announce a fundamental inconsistency in accepted scientific beliefs, declare the need for a revolution, perform it, and walk out. Things are simply not done this way.<sup>6</sup>

It is also possible to maintain that Newton was wrong and that rejecting his theory was a rational move on the part of contemporaries. Torger Holtmark formulated a basic contradiction he stumbled upon in the Newtonian terminology: 'Newton thought that he explained the existence of a spectrum by means of a physical model of the light, whereas he in fact used the image of the spectrum to explain one possible physical model of the light.'<sup>7</sup> All these readings are uncharitable in their own way to at least some of the parties in the controversy. I propose a charitable reading, but there is a price to pay: in order to believe that several of the parties in the optical controversy of the 1670s approach our standards of rationality—that is, that their argumentative moves are not derailments—one must seriously consider the possibility that there was an inherently deep conflict between the parties, and that more than purely scientific views were at stake.

5 See Westfall R.S., "Newton Defends His First Publication: The Newton-Lucas Correspondence", *Isis* 57, 3 (1966) 303; Kuhn T.S., "Newton's Optical Papers", in Cohen I.B. (ed.), *Isaac Newton's Papers & Letters on Natural Philosophy* (Cambridge: 1958) 34.

6 Bechler Z., "Newton's 1672 Optical Controversies: A Study in the Grammar of Scientific Dissent", in Elkana Y. (ed.), *The Interaction between Science and Philosophy* (Atlantic Highlands: 1974) 116–117, and also the 'mainstream' rhetorical analysis in Bazerman C., *Shaping Written Knowledge. The Genre and Activity of the Experimental Article in Science* (Wisconsin: 1986).

7 Holtmark T., *Colour and Image* (Berlin: 2012) 49.

I build up my argument tracing the conflicts inherent in seventeenth-century optical terminology to analyse the form of Newton's presentation and the content of his theory. Both form and content are relevant for understanding the fine mechanics of a controversy, as any conflict between positions can be exaggerated or downplayed by any of the parties via the strategic use of topical potential when communicating a position. The concept of 'strategic manoeuvring', a key concept in pragma-dialectics,<sup>8</sup> is utilized in order to bridge philosophically minded and socially sensitive approaches to the historical reconstruction of Newton's position, a truly and wonderfully new vision about light and colours that was presented as a refutation of all known theories.

### The Deep Disagreement: Rejecting Modificationism

Newton knew that there was a significant difference of opinion between him and all the known sources he had consulted. At around the time Newton composed his "New Theory of Light and Colour", he noted in his *Optical Lectures* (*Lectiones opticae*) that contemporary theories 'all agree in a certain common error; namely, the modification of light by which it exhibits different colours is not innate to it from its source but is being reflected or refracted'.<sup>9</sup> It is generally agreed that Newton's historical narration in the 'New Theory' is a stylistic invention (considered legitimate around the time), and his 'observations', the way he described and depicted them, are meant to provide the strongest possible support for his theory.

The deep conflict was explicated in the short letter in which Newton presented his case, not only as a 'New Theory' in content, but also a novel methodology. Newton was aware of a disagreement, and he granted it focal position in the exposition of his theory. The letter announced a

New Theory about Light and Colors: where Light is declared to be not Similar or Homogeneal, but consisting of difform rays, some of which are more refrangible than others: And Colors are affirm'd to be not Qualifications of Light, deriv'd from Refractions of natural Bodies, (as 'tis generally believed;) but Original and Connate properties, which in divers

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8 Eemeren F.H. van, *Strategic Maneuvering in Argumentative Discourse: Extending the Pragma-Dialectical Theory of Argumentation* (Amsterdam – Philadelphia: 2010).

9 Isaac Newton, *The Optical Papers of Isaac Newton*, ed. A.E. Shapiro (Cambridge: 1984), vol. 1, 85.

rays are divers: Where several Observations and Experiments are alleged to prove the said Theory.<sup>10</sup>

Newton's knowledge claim, as with any novel scientific claim, went against the *endoxa*: how others—that is, everyone else—believed something to be the case, when it was not. He presented the stasis of the deep disagreement in his letter as a discovery of a *demonstrative truth*, and this clearly had an impact on his burden of proof.

In the medieval tradition, colours were generally categorized as either *apparent* or *real*. Atmospheric optical appearances, including rainbows and haloes, belonged to the first group, also called *emphatical* colours. Opposed to these colours, which could not be considered as properties of surfaces or objects, the so-called *real* colours were localisable on the outer surfaces of objects. Unlike artistic theories of colours (mostly focusing on mixing pigments) natural philosophical theories concentrated on apparent or emphatical colours. The separation had become increasingly unclear, and in the early modern period some subset of (apparent) colours was used to explain all colour phenomena.

Newton stated the heterogeneity of white light, but for all other authors the modification of homogeneous light supplied the theoretical model that explained colour phenomena. His basic tenet (rejecting modificationism) was linked to a number of other beliefs, and therefore created conflicts in other parts of the semantic web of contemporary optics. Newton did not settle for two primary colours, as did most natural philosophers of the period, although this claim was not centrally positioned.

It is notable that while Newton made many clear distinctions, in some cases his wording left room to argue for or against a number of positions. The first example discussed is the wording of Proposition 5 of the colour-theory put forth in the letter. Although it is a grammatically correct, meaningful sentence, and is presented as a proposition of a theory of colours, the ambiguity of the natural language sentence is fairly obvious:

5. There are therefore two sorts of colours. The one original and simple, the other compounded of these. The Original or primary colours are, *Red, Yellow, Green, Blew*, and a *Violet-purple*, together with Orange, Indico, and an indefinite variety of Intermediate gradations.<sup>11</sup>

10 Isaac Newton, "New Theory About Light and Colors", *Philosophical Transactions* 80 (1671–1672) 3075.

11 Newton, "New Theory" 3082.

How many simple colours are there in Newton's rainbow? The historical record attests that various interpretations existed, and this suggests that although we hail Newton for unweaving the rainbow, it is unclear what exactly his position on the number of colours in the rainbow was. How can one read an ambiguous position in a charitable fashion?

Below, I suggest that the ambiguous wording of Proposition 5 of Newton's "New Theory" on simple colours is a case of strategic manoeuvring that helped to circumvent objections connected to scholastic or perspectivist interpretations of mathematical optics. Provided that we think of theories as sets of statements, or propositions, I argue that Newton allowed for all the possible 'solutions' in his proposition. If the number of simple colours is  $x$ , then Newton allows four possibilities: a)  $x=5$ ; b)  $x=7$ ; c)  $x=\infty$ ; d) there is no correct answer, but there are at least two colours.

The ambiguity of Proposition 5 contributed to *underspecifying* the position, as multiple readings could be constructed from one source and this is one way to *strengthen* both the position and the impact of the message, and to marginalize and circumnavigate the value-conflicts that were the results of the "New Theory".

Vagueness is one of the techniques available for maximizing manoeuvring potential in defence of a more central claim, and this appears to show that Proposition 5 was a linked but subordinated part of Newton's theory. I will discuss this less studied proposition of the colour theory to show that if challenged, or if precision was required, Newton's position was underspecified, and if he decided to defend the claim, his ambiguous wording left room for at least five readings: an experimental, a harmonic, a physical-optical, a geometrical, and an elliptically charitable one.

### Proposition 5 of the Theory of Colours

Newton conformed to the fashionable schema of using research on a colour domain that is then used as the *explanans*, potentially able to explain *all colour phenomena* in the world. As Proposition 5 has two qualifiers, 'original' and 'simple', the text suggests that the category aims to bridge terminological differences.<sup>12</sup> In a number of Newton's published drawings there are five circles placed in the oblong spectrum, like five small images of the sun spread across his spectrum. In the debate following his publication he was adamant about

<sup>12</sup> On the use of conceptual chiasmus in interdisciplinary setting see Ceccarelli L., *Shaping Science with Rhetoric: The Cases of Dobzhansky, Schrödinger, and Wilson* (Chicago: 2001).

the ratio of the spectral image, i.e. that the length of the coloured image was at least about 5 times the diameter of its breadth. He suggested that threefold elongation testifies to bad experimentation, and these reasons give some initial plausibility for an '*experimental*' reading of Proposition 5, where the number of colours is somehow connected to the ratio of the length and breadth of the spectrum, and so is about five.

Linguistically inserting two elements after listing the first five (italicized) colours in the proposition separates these from the five they accompany. This technique hides a potentially explicable dichotomy in the structure of the formulation of the statement, separating the first five colours that a good enough experimenter could produce with the experimental set-up Newton described, from the remaining two, the thinnest bands on the harmonic solution that the ideal, Pythagorean solution mapped with the famous seven colours of the rainbow.<sup>13</sup>

There are therefore two 'finite' readings of Proposition 5, and, though this is less obvious, two 'infinite' ones, as there is a further ambiguity in the proposition. If rays of light differ in refrangibility and the refrangibility of light rays is strictly connected to their colour, then there are as many simple colours as types of light-rays. But what kind of rays? In geometrical optics, stating that 'an indefinite variety' of intermediates exists implies an uncountably infinite set, but in the physical optics of actual light corpuscles (and models or diagrams of these) 'an indefinite variety' can only mean a countably infinite set. And if the types of refrangibilities are so many, does it make any sense to talk of simple colours as 'Original and Connate properties', which in diverse rays are diverse, and therefore specify an infinite number of types/categories? As Newton saw an uninterrupted spectrum, the mixed mathematical solution intends to map a newly discovered property of light with a sensory domain, the perception of colour, and as there are indefinitely many types of refrangibilities, so are there indefinitely many types of simple colours. An indefinite variety of intermediate gradations characterizes both qualities, the discovered primary (explanans,

13 Penelope Gouk argued that the harmonic solution appeared after the five-fold division Gouk P., "The Harmonic Roots of Newtonian Science", in Fauvel J. et al. (eds.), *Let Newton Be!* (Oxford: 1994 [1988]) 118. Lohne noted 'the similarity of the consonants in the word "spectre" and the letters p, q, r, s, t, used by Newton on several diagrams for designating the five principal colours of the spectrum' in Lohne J.A., "Experimentum Crucis", *Notes and Records of the Royal Society* 23 (1968) 198.

the measurable outside world) and the subjective secondary (explanandum, the perceived inner reality).<sup>14</sup>

### Elliptically Charitable Reading: No Colours, Only Light

The above four interpretations all do some justice to Newton's theory of colours, offering an alternative to scholastic theories of perception. As any theory is a set of statements or propositions, Newton's novel theory was not just a single claim, but a *bundle* of claims woven together. Many physicists understand the *one* crucial experiment that Newton provided in his letter as establishing with certainty only *one* fact/statement/mini-theory: there is at least some difference in the refrangibilities of rays coming from the sun.

To maintain that there is an infinite number of simple colours not only runs counter to the principle of economy—why multiply types without necessity?—but is also outside the boundaries of physics, a part of Newton's legacy that need not survive in high school and university textbooks, that need not be investigated by philosophers of science. Oldenburg, the editor and publisher of the first letter, left room for this weak understanding of the theory by omitting passages in the printed version of the letter from Newton, including the equivalence thesis: 'A naturalist would scarce expect to see ye science of those [colours] become mathematicall, & yet I dare affirm that there is as much certainty in it as in any other part of Opticks.'<sup>15</sup> Treating the claim that there are as many simple colours as types of light-rays as a non-essential part of Newton's theory, this *ellipsis* downplays the relevance of the whole of Proposition 5, indeed of Newton's whole theory of colours. The claim that refrangibility of light rays is strictly connected to their colour is only stated, not proved, as Newton developed his *minimal* position, in a response to Lucas: 'you think I brought it [the crucial experiment], to prove that rays of different colours are differently refrangible: whereas I bring it to prove (without respect to colours) yt light consists in rays differently refrangible'.<sup>16</sup> Newton asked the Secretary of the Royal Society not to publish his 'fallback' position, developed as the result of the persistent Jesuit critique in a response to Lucas, and

14 Stein H., "On Locke, 'the Great Huygenius, and the Incomparable Mr. Newton'", in Bricker P. – Hughes R.I.G. (eds.), *Philosophical Perspectives on Newtonian Science* (Cambridge, Mass: 1990).

15 Turnbull H.W. (ed.), *The Correspondence of Isaac Newton I. 1661–1675* (Cambridge: 1959) 96.

16 Turnbull H.W. (ed.), *The Correspondence of Isaac Newton II. 1676–1687* (Cambridge: 1960) 257.



reclaimed his theory in the *Opticks*. This fifth interpretation sacrifices Newton's theory of colours to salvage his theory of light.

With respect to basic colours that one could use to explain the appearance of other colours, his theory was very uneconomical (and this was pointed out by Hooke and Huygens). In this reading the fifth proposition's primary significance is that it makes a new type of category-split, and not that it correctly specifies the elements in any of the categories.

It could be claimed that Newton did not give a precise number of primary colours as an alternative to modificationism, the theory he wanted to replace. Maybe Newton had no incentive to reach common ground on the exact number of simple colours, to resolve any differences of opinion. Maybe his theory did not really require the specification of 'simple colours', but, as all rival theories differentiated a small subset of (usually two) colours, he complied with the norm, and provided a list of colours. If Newton's theory is only a theory of light, his proof does not extend to including the precise establishment of the number of colours. This interpretation is *elliptically* charitable to Newton: the meaning (propositional content) of Proposition 5 is simplified, highlighting focal (structural) elements within the sentence, and downplaying the ambiguity of other elements.

### Twofold and Threefold Categorizations and Newton's Seven Simple Colours

Successful theories of colours, as Hooke claimed for his own,

are capable of explicating all the *Phenomena* of colours, not onely of those appearing in the *Prisme*, Water-drop, or rainbow, and in *laminated* or plated bodies, but of all that are in the world, whether they be fluid or solid bodies, whether in thick or thin, whether transparent or seemingly opacious.<sup>17</sup>

Hooke's statement separates the *emphatical colours* of Antiquity from the interference colours, italicizing not only the well known prism, but also his discovery of colours in laminated bodies, subtly delineating three subsets of colours, championing the new territory he explored, and used for his self-fashioning in the *Micrographia*.

<sup>17</sup> Hooke Robert, *Micrographia, or, Some physiological descriptions of minute bodies made by magnifying glasses* (London, by John Martyn and James Allestry: 1665) 67.

Newton's Proposition 5 in the "New Theory" uses a category split, like the texts of his contemporaries. The "New Theory" only contained a *twofold* separation of the colour domain, and during the controversy Newton published the 'missing link' to connect his 'simple' colours through interference colours (described by Hooke) to colours of objects, antiquating the longstanding separation of apparent ('rainbow') colours and real colours, and giving a mathematical treatment of colours *in toto*. His nomograph, 'whose odd appearance and oracular directions for constructions bely its intrinsic simplicity',<sup>18</sup> connected the harmonic image of 'simple' spectral colours along the horizontal axis with the periodic colours of Newton's rings (discovered by Hooke), and provided a model for an explanation of real colours, connecting the three subsets of colours in his explanatory chain to correspond to Hooke's classification.

Newton developed a position to claim superiority and primacy for his discovery in the explanatory chain both in case we accept a 'perspectivist' twofold categorization of colours, or a more refined, threefold 'naturalist' or Hookian categorization: there are two sorts of colours (the ones discovered by Newton, and all other colours, including those discovered by Hooke), and there are seven types of simple colours (according to some harmonic ratios).

In 1675, Newton published a diagram in a letter with seven colours arranged according to the tones of the musical octave. Instead of writing the well-known ratios for sounds, he added the colour names and their musical 'equivalents' in 'quality'. From AG to FM the lines were labelled *Sol, La, Fa, Sol, La, Mi, Fa, Sol*, while the regions between the lines were bands of colour *Purple, Indigo, Blue, Green, Yellow, Orange, and Red*. The strict 'qualitative' analogy between musical tones and colours reappeared in his *Opticks*, supporting the view that the number of basic colours is seven.<sup>19</sup> This '*Pythagorean*' invention appears to be an *intended meaning* of Proposition 5, canonizing the number of colours in the spectrum, the nomograph, and the rainbow as seven and Newton's supremacy over Hooke.

### Vague Assertions and the Burden of Proof

Newton's attempt to persuade was extremely influential. His optical theory provided more than one stable path of reception as the multiple meanings

18 Shapero A.E., *Fits, Passions, and Paroxysms: Physics, Method, and Chemistry and Newton's Theories of Colored Bodies and Fits of Easy Reflection* (New York: 1993) 89. The nomograph's best depiction is in a draft of the "Discourse Concerning Light and Colors" (Cambridge University Library, MS Add. 3970 .3, fol. 522r).

19 Ibidem.

hidden in the fifth proposition offered his diverse readership alternative readings of the same letter. Were these alternative readings all wrong, apart from *one*? If so, the *other* readings are misreadings of Newton's theory, but which is right? Where a decent experimenter using the experimental set-up described by Newton sees five coloured images of the Sun, in the ideal spectrum there are seven colours. This 'harmonic' set of primary colours utilizes Ancient, non-Euclidean mathematics, and is more Pythagorean or Fluddian than would be expected from someone well-versed in Descartes (who was himself well-versed in Kepler). There is, furthermore, a trace of a mixed mathematical explanatory account of perception, using a vague ray concept, referring by 'an indefinite variety' to either a countable or an uncountable infinite set, elements of which are *types* and/or *tokens*.

The ambiguity presented in Newton's proposition on simple colours is easily presentable as a stratagem, aimed at credit-seeking as opposed to knowledge-seeking, to win the case without having a clear case. If his Proposition 5 of the Doctrine is only a proposition in the sense that it is asserted as such, a performative speech act, and the specifics of its meaning are secondary, then some form of social compliance suffices, e.g. the assertion that his (ambiguous) views expressed in the message are endorsed (whatever they are). If there is no need for a protagonist to adopt a single, well-individuated standpoint (*logos*) in a scientific controversy on a critical (focal) issue then anyone endorsing the 'New Theory' can endorse any of the previously differentiated answers to the question of simple colours. One can be a 'true' Newtonian, and there is no 'true' Newtonian position in a propositional sense: the position was explicated in a body of texts and diagrams, yet the *meaning* was not individuated clearly.

The fact, however, that his theory contributed to the advancement of science and learning makes us believe that his theory was epistemically superior to those of his contemporaries. The epistemic merit of Newton's ideas is, however, contingent on the social merit; the fact that for many, his was the true theory of light and colours. The physicist's ellipsis is considered as the epistemically superior reading, while the Pythagorean invention was the most widespread reading of Newton's theory. Both normative (dialectical, 'logician', or critical rationalist) and descriptive (rhetorical, situated, or anthropological) approaches can give an account of Newton's topical choices, adjustments to audience demand and presentational choices.

'Strategic manoeuvring' originates from pragmatically informed argumentation theory, and I use this framework to reconstruct a series of conflicts that resulted in the apparently anomalous reception of Newton's optical paper. As a researcher, he had to invent moves that circumvent topical constraints and earlier conventions that inherently characterized the optics of his age. I now

investigate the notorious crucial experiment, a technical, Baconian neologism that Hooke created and Newton appropriated.

### Experimenting with Vague Objects: The Blurred Boundaries of a Prism

The reception of Newton's theory shows that the ambiguities (as well as his well known and well advertised precision) contributed to the enormous success of his views; his language use and the visual aids were jointly responsible for his stylistic effectiveness. Newton controlled the level of clarity of his meaning through the use of ambiguous sentences and diagrams, contradictory claims, and even through the partial banning of the correspondence; he held the key to what his theory meant.

Investigating the argumentative structure of the "New Theory", we can read the text in two ways: as an exposition of a scientific discovery, and as a manifesto of the championed scientific methodology. The 1672 letter has been appropriated by philosophers of science of various positions, so it is more convenient to start with the scientific discovery that Newton claimed to have proved. As Lucasian Professor of Mathematics, his claims were clearly relevant for traditional geometrical optics—they were evolutionary as well as revolutionary:

According to Newton's article from 1672, there were at least four major problems he endeavored to solve: first, to explain the phenomenon of the chromatic dispersion of sunlight; secondly, to establish a framework for a mathematical science of colors within which mechanistic interpretations would comprise only part of the explanation of colors, subordinated to the mathematical principles of illumination; thirdly, to settle the debate between mechanical philosophers and the peripatetic school, about the physical properties of color images; fourthly, to find a practical solution to the problem of chromatic aberration in optical instruments.<sup>20</sup>

Newton's commitments as to what his experiments proved (the refrangibility of light rays, a new physical property, or the claim that rays of different colours are differently refrangible) were wavering in the 1670s.<sup>21</sup> The key methodologi-

20 Ben-Chaim M., "The Disenchanted World and Beyond: Toward an Ecological Perspective on Science", *History of the Human Sciences* 11 (1998) 119.

21 Schaffer S., "Glass Works: Newton's Prisms and the Uses of Experiment", in Pinch D. – Gooding T. – Schaffer S. (eds.), *The Uses of Experiment: Studies in the Natural Sciences* (Cambridge: 1989).

cal innovation Newton proposed, the 'crucial experiment' or *experimentum crucis*, could not be clearly delineated from the other experiments based on the function of the experiment.<sup>22</sup> With respect to the experimental set-up, he 'explicated' the real state of affairs only once challenged, adding an extra lens to the first prism in the *experimentum crucis*, and only gradually shed light on the existence of a crucial factor concerning the *repeatability* of his experiment.

Newton left out a focal element of the experimental proof of the theoretical content he aimed to defend, and also a focal element of the experimental set-up, which had determined the relationship and distance of the objects. In his first published drawing, he presented a prism without a lens, but later in writing he described the prism as already including the lens. In a letter to the Jesuit Lucas Newton, he measured the distance of his prism and the wall as '18 feet & 4 inches', and asserted that his prism was somewhat convex. More precisely, 'the convexity being about as that of a double convex glass of a sixteen or eighteen foot Telescope'. As he writes:

If a Prism may be had wth sides exactly plain, it may do well to try ye experiment wth that: but it's better if ye sides be about so much convex as those of mine are [...]. For this convexity of ye sides does ye same effect as if you should use a Prism wth sides exactly plain, & between it & ye hole in ye window shut, place an object glass of an 18 foot Telescope.<sup>23</sup>

Newton's later description of the convexity of his prism means that his 'quasi-lens' existed but its existence was not made public before a challenge was made. His first prism in the crucial experiment with which he achieved his results had an 'inbuilt' lens, omitted from the drawings. The prism's distance from the wall (the focal length of a suggested lens) matched conveniently the error-prone approximate measurement of the quasi-lens embedded in the prism. In his first letter and drawings, he omitted an optically decisive property of his prism, and it was this hidden variable (its chance deformity) that instructed the positioning of the key element of the crucial experiment. The quasi-lens had an effect (it determined where the prism was put in relation to the wall), yet it was left out of the publicly available description for four years.

22 Newton's reference to a crucial experiment is in fact a rhetorical device, selected from an experimental series: see Marcum J.A., "The Nature of Light and Color: Goethe's 'Der Versuch Als Vermittler' Versus Newton's Experimentum Crucis", *Perspectives on Science* 17 (2009) 473.

23 Turnbull (ed.), *Correspondence of Isaac Newton* II 78.

Developing his position this way allowed Newton to criticize others for not achieving his standards of measurement. Yet these measurements were obtained with a quasi-lens: one that is only visible when the occasion calls for it. Even a mathematical science of colours is in need of rhetorical invention. Before admitting this peculiar (ir)regularity of his lens, however, he is first careful enough to suggest to others the optional use of an additional lens. In the letter communicated to the Society on 13 April 1672 he noted that '[i]f an accurate consideration of these refractions be designed, it is convenient, that a *Lens* be placed in hole F, or immediately after the Prisms, so that its focus be at the image Q or PT'.<sup>24</sup> The quasi-lens built into the prism emerged during the early optical debates in the 1670s, creating a nexus between the prism in 1672, and the prism with a lens in the 1710s, the famous experimental trials carried out by Desaguliers, that helped spread the Newtonian views in the eighteenth century, and created a controversy in twentieth century historiography on the identity of the crucial experiment.

In experimental systems, we tend to think of objects as individuated and ordered, but Newton uses linguistic and graphic resources that blur not only the order, but also the number of objects, fusing experimental set-ups that consisted of varying number of objects.

### Increasing Social Credit and Satisfying Dialectical Norms

Why did Newton downplay the significance of the specific irregularity of his unique object? Why not describe the crucial experiment with a lens in the first place? Is secretiveness an example of strategic manoeuvring gone astray, or derailed even? The analysis of language use, linguistic innovation and persuasive speech could suggest that Newton's aim was not to join a communal enterprise for truth, but rather to accumulate social credit for a theory that seriously conflicted with contemporary geometrical optics.

How are we to reconstruct Newton's theory if the text is written in such a way as to resist the effort at disambiguation? Multiple ambiguities suggest that the article required complex reconstructive work from the reader. As trivial an issue as the number of simple colours, for instance, could be interpreted in *more than one way*, and the same goes for many of the diagrams that Newton provided: the 'New Theory' described the lens as close behind the first board,

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24 Newton Isaac, "Some Experiments Propos'd in Relation to Mr. Newtons Theory of Light [...] Together with the Observations Made Thereupon by the Author of That Theory; Communicated in a Letter of [...] April 13. 1672", *Philosophical Transactions* 7 (1672) 4062.

but in the first drawing it was in front of the board; the rays of the drawings conform partly to geometrical optics and partly to physical optics.

What is the function of ambiguous wording, of multiply readable 'near-precise' drawings and of a focal point of the crucial experiment downplayed as peripheral? If the vagueness was intended and objects can have their boundaries blurred, we see that 'objects' and facts are constructed in scientific controversy.

Newton's unclear position, with the intentional vagueness of wording and consistent variation in representational tools, was a rational attempt to give 'shorthand' versions of his new theory. He created a deep conflict by contrasting his theory in an either/or fashion with all known theories and provided with it an argumentative structure and an unconventional methodology for his readers. Newton presupposed an opposition, a rival modificationist claim, and presented arguments against that position.

The original publication of the theory demonstrated the impossibility of modificationism, it was an apagogical proof that masqueraded as a Baconian letter describing observations, conforming to Hooke's terminology and experimental methodology. It was compatible with a Cartesian, geometrical optical treatment, starting with an analysis and elimination phase, and proceeding with a synthesis, but Descartes's Discourse 8 in his *Meteorology* ended with trivialities, like optical illusions in fountains, while the 'New Theory' ended with robust ontological claims. His rhetorical strategy to replace theoretically and also methodologically significant seventeenth century conventions was based on an elliptical demonstration of several claims.

Newton wanted to separate white light that was considered by contemporaries to be homogeneous, and believed that 'simple' colours are hidden in the flux of white light from the Sun. The inverted image convention used a topological mapping to account for the position of the whole outside world in a camera obscura or in the eye, but Newton's 'bundles' were dynamic. Newton even asserted grand metaphysical and ontological claims, but none of the psychological or physiological elements that he developed appear in the "New Theory".<sup>25</sup> He granted certainty to his claims but provided the minimum amount of detail to substantiate these at the end of his letter:

These things being so, it can be no longer disputed, whether there be colours in the dark, nor whether they be the qualities of the objects we see, no nor perhaps, whether Light be a Body. For, since Colours are the

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25 Steinle F., "Newton's Colour-Theory and Perception", in Petry M.J. (ed.), *Hegel and Newtonianism* (Dordrecht: 1993).



qualities of Light, having its Rays for their intire and immediate subject, how can we think those Rays qualities also, unless one quality may be the subject of and sustain another; which in effect is to call it substance. We should not know Bodies for substances, were it not for their sensible qualities, and the Principal of those being now found due to something else, we have good reason to believe that to be a substance also.

Besides, who ever thought any quality to be a heterogeneous aggregate, such as Light is discovered to be. But, to determine more absolutely, what Light is, after what manner refracted, and by what modes or actions it produceth in our minds the Phantasms of Colours, is not so easie. And I shall not mingle conjectures with certainties.<sup>26</sup>

### Changes in the Lexicon, and Securing the Ethos

In the seventeenth century, experiments with prisms played an important role in natural philosophical inquiries concerning the emergence of colours, and the mathematization of colour seemed to be a paramount problem. The ratio of the spectral image is strange, so Newton did discover a new phenomenon, but this was reconcilable to the perspectivist and modificationist tradition. The ambiguous form of presentation presented the theory in such a way that a 'fallback' position was secured in the old, geometrical optical lexicon. For his novel ontological claims one had to understand, accept, and use the new elements in the lexicon, 'spectrum' and 'refrangibility'.

It is noteworthy that Newton made changes to the lexicon as he presented the deep disagreement, and thus he formulated his claim in a (potentially) new language of optics. The new optical theory was communicated in an article that added *one term* to the semantic web (vocabulary extension via 'spectrum'), and that made modifications/specifications to (at least) *two concepts* of the linguistic fabric of contemporary optics (*experimentum crucis*, refrangibility).

To separate the chromatic problem of the elongated and fully coloured image from the optical problem of image-inversion, Newton introduced a new element into the observational lexicon: 'spectrum'. He provided a series of eliminative steps, as a form of *exhaustion* of alternative theories. He provided an experimental key to readers to see his spectrum, yet the description of the set-up neglected his 'quasi-lens'. The result of his analysis was in practice unachievable, as his experiments gave better results than the experimental set-up he described. After this 'demonstrative' step he presented his solutions: a

26 Newton, "New Theory" 3085.



new theory of colours, a new property of light rays (refrangibility), and a new ontology of light, with a mechanistic account of perception.

The notion of the crucial experiment allowed Newton to present a very strong case, a demonstrative proof of ontological claims. At the same time it was used to argue against taking up the burden of proof, as the proof had already been presented. The novel presentational form, the genre of the scientific article with didactic diagrams, enabled the communication of minimum empirical evidence; Newton listed a few experiments only and focused on one. In the "New Theory" he asked for experimental rebuttal, and when years later Lucas listed numerous experiments to challenge Newton, he refused to defend his standpoint, as he could stress that one single experiment carried all the weight. Any serious critic had to address the *experimentum crucis* first, and when it was challenged, Newton responded by decreasing the burden on this single experiment. The relevance of the notion of the crucial experiment was that the strength and the precise positioning of the theory could be negotiated via this epistemic carrier.

If an explicit disagreement is presented, if *novelty is claimed*, then the claim can be challenged: 'To fashion a new persona requires a delicate balance between old and new cultural forms.'<sup>27</sup> Isaac Barrow, Newton's mentor, presented proofs, but often, for the sake of brevity and perspicuity, used the less rigorous of the available options in his publications.<sup>28</sup> Just a generation before Descartes, in the tradition of the *Rechenmeister*, it was common to use elliptic presentational techniques when presenting problems and solutions with many of the steps left out in between, to lure prospective students to the Master for tuition.<sup>29</sup>

Claiming that one is right (stressing ethos), without clearly saying what is right and why one states that (logos), was quite common in the seventeenth century. It had extreme forms, like Christiaan Huygens's proposed solution to a query on Saturn's supposed 'handles', stating his discovery in the form of an anagram in a two-page treatise: 'a a a a a a c c c c c d e e e e h i i i i i l l l l m m n n n n n n n n o o o o p p q r r s t t t t t u u u u u'.<sup>30</sup> Huygens wanted to secure a position for his discovery, but did not want to explicate it: 'Annulo cingitur,

27 Daston L. – Sibum O.H., "Introduction: Scientific Personae and Their Histories", *Science in Context* 16, 1–2 (2003) 5.

28 Guicciardini N, *Isaac Newton on Mathematical Certainty and Method* (Cambridge, MA: 2009) 178.

29 Schneider I., *Johannes Faulhaber, 1580–1635: Rechenmeister in Einer Welt Des Umbruchs* (Basel: 1993).

30 Huygens Christiaan, *De Saturni luna observatio nova* (The Hague, Adriaan Vlacq: 1656).

tenui, plano, nusquam cohaerente, ad eclipticam inclinator'.<sup>31</sup> As seventeenth century reception of similar discoveries was not always smooth, it was rational to present a concealed position to minimize potential social damage to oneself, even if this sacrificed the basic (propositional) expectations of clarity.

Does enabling multiple meanings not automatically count as a derailment of dialectical, epistemic, 'truth seeking' goals to prioritize rhetorical effectiveness? As any talk about meanings, values, and reasonability hinges on the accountability of the ego, the stability of a position is crucially linked with the status of the protagonist. To present a case with epistemic carriers (texts and diagrams) that offer alternative meanings for the reader endangers the *logos* in an attempt to secure the *ethos*.

Newton's analysis yielded a key bridge term—'refrangibility'—a property of light in geometrical optics (an uncountably heterogeneous set of geometrical rays) and a property in physical optics (a countably heterogeneous set of physical rays, i.e. corpuscles). Newton's ambiguously presented theory was within the bounds of contemporary 'geometrical philosophy', as for Barrow, Newton's mentor and supporter, mathematics was coextensive with physics, as the *object* of mathematics was magnitudes generated by motion.<sup>32</sup>

Newton not only stated his theory, he also defended it, though not all of it, and not against every objection his peers raised, but even so not without self-contradiction. Setting aside the question of rhetorical effectiveness, proposing a 'New Theory' presupposed an opposition, a rival claim, and Newton asserted that he presented demonstrative arguments against *that* position. Newton stood for the correct theory of light by 'as much certainty' as could be granted to his mathematization of colour, his strategic manoeuvring to persuade readers aimed at satisfying heterogeneous audience demands. When his deviation from traditional geometrical optics was noted by Hooke, and Newton had to admit that his theory already presupposed hypothetical (physical) principles:<sup>33</sup> 'he but who knows not that Optiques & many other Mathematicall Sciences depend as well on Physicall Principles as on Mathematicall Demonstrations: And the absolute certainty of a Science cannot exceed the certainty of its Principles'.<sup>34</sup>

31 'It is surrounded by a thin flat ring, nowhere touching, inclined to the ecliptic.'—ibidem.

32 Guicciardini N., *Isaac Newton on Mathematical Certainty and Method* (Cambridge, MA – London: 2009) 171.

33 This kind of 'physical' optics did not exist before Newton's and Huygens's work, but grew out of attempts to grasp colours and optical phenomena mathematically. Dijksterhuis F.J., "Once Snell Breaks Down: From Geometrical to Physical Optics in the Seventeenth Century", *Annals of Science* 61 (2004) 167.

34 Turnbull (ed.), *Correspondence of Isaac Newton* 1 187–188.

Although both the text and the images that Newton used to convey his views were ambiguous, this was a conventional way to satisfy the conventionally heterogeneous set of sufficiency-conditions of seventeenth century optics. By demonstrating that he held the key to the discovery, Newton presented a form that maximizes ethos and social credit. After all, it is egos that stand in the arena, and it is they who take up the positions we analyze. According to this radical historical interpretation, the shorthand used in the “New Theory” coded Newton's claim to fame, composed in a way that could minimize the possibility of rejection and defend the position from refutation by claiming demonstrativity.

It is enough to communicate a radically new theory in a language ‘near precisely’ understood by peers, and an *unclear position* can be a legitimate argumentative move in presenting one's claims in deep conflict. Lexicalizing the discovery enabled Newton to significantly increase the topical potential available, but the deep conflict created by his positioning could not be resolved. As would be expected from any decent stalemate, two arguments (dissoi logoi) were developed, and no serious harm was done.

With respect to the disagreeing parties (and their arguments) this implies that it is possible to consider all as rational (with respect to their own respective lexicons), and the controversy could thus become epistemic in spite of the fact that there was no reason to expect any of the participants to clearly speak their minds. Queries to Newton, and his progressive explication of the theory helped contemporaries to raise criticism, which, in turn, helped Newton to readjust the scope of his optical enterprise.

The ‘Newtonian method’ does not only exist in an abstract space of philosophical positions, where we can search for it, but it is also manifest in the several letters, arguments, and expositions that helped pre-empt criticisms locally, in the respective (heterogeneous) discourse community.<sup>35</sup> Deduction failed Newton as a technique of persuasion, and in the various editions of the *Opticks* he presented a progressively strengthening inductive argument (and methodology) by incorporating the physical hypothesis at the level of definitions of the work.<sup>36</sup>

Huygens waited three years before publishing his discovery of Saturn's rings in a book. Newton carefully changed the wording in his *Opticks* when early critics, including Huygens, pointed out inconsistencies, and waited 32/33 years to publish his book on optics. His name was absent from the first edition's title

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35 Zemplén G.Á., “The Argumentative Use of Methodology—Lessons from a Controversy Following Newton's First Optical Paper”, in Dascal M. – Boantz V.D. (eds.), *Controversies in the Scientific Revolution* (Amsterdam: 2011).

36 See also Chapter 4 in Ducheyne S., *The Main Business of Natural Philosophy—Isaac Newton's Natural-Philosophical Methodology* (Dordrecht: 2012).

page, written in English. He also waited a few more years to produce a Latin edition.

Classifications, hierarchical structuring of claims and ‘well-chosen’ depictions or descriptions of experiments minimize the burden of proof and maximize the manoeuvring potential. To legitimate his optics as a mathematician, Newton added treatises on curvilinear figures to the first edition of the *Opticks*. He also sought to mitigate the conflict between his physical theory of light, *invented* in isolation together with the diagrammatic convention of bundles of rays, and the *existing* geometrical optical tradition of camera obscura drawings, as well as the images of the retinal *pictura*. These fitted modificationist theories,<sup>37</sup> but did not suit Newton’s. Yet Newton placed his experimental proof in a camera obscura setting for the frontispiece of the French edition, conforming to his enemy, so to speak.<sup>38</sup>

New knowledge contrasts with old, and significant new knowledge contrasts with important elements of the old conventions, often deeply entrenched in the conceptual matrix of a community. A prerequisite for any successful optical theory in the period was that it should be presentable in a graphic form and should satisfy certain theoretical expectations. Newton’s “New Theory” put enormous weight on a quite specifically designed single experiment, but he gave no visual representation of the experimental set-up. Even the mostly laudatory Lohne notes that ‘[f]or unknown reasons a diagram of this experiment [the crucial experiment] is lacking in the February issue of the *Philosophical Transactions*. In June 1672 Oldenburg published a rather inaccurate reproduction of Newton’s original diagram’.<sup>39</sup> Some later drawings utilized ‘bundles’ of rays, some single rays, and some angular sizes. Theories at the time were written up in prose, accompanied by drawings and mathematical formulae. We can therefore talk of strategic manoeuvring with respect to both the discursive and the visual/graphic content. Newton had to develop new linguistic resources as well as new drawing conventions that enabled multiple interpretations, to present an alternative that was even plausible to the opposing theory, modificationism. In theology, Newton believed that God revealed the truth through

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37 Garber M.D., “Chymical Wonders of Light: J. Marcus Marci’s Seventeenth-Century Bohemian Optics”, *Early Science and Medicine* 10, 4 (2005) 493.

38 Snobelen discusses two strategies of concealment in Newton’s later religious work: simulating conformity and dissimulating or dissembling non-conformity. See Snobelen S.D., “Isaac Newton, Heretic: The Strategies of a Nicodemite”, *British Journal for the History of Science* 32 (1999) 396.

39 Lohne, “Experimentum Crucis” 182.

prophecies, 'to try men, and convert the best'.<sup>40</sup> And that is exactly what his first article tried, and, with time, achieved.

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40 National Library of Israel, Yahuda MS 1.1a, fol. 18r, quoted in Snobelen, "Isaac Newton, Heretic" 389.

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# The Birth of Epistemological Controversy from the Spirit of Conflict Avoidance: Hobbes on Science and Geometry

*Axel Gelfert*

## Summary

Thomas Hobbes's political philosophy has typically been discussed in isolation from his theoretical philosophy, which is marked by a decidedly mechanistic worldview. The present paper argues that the theoretical and practical parts of his philosophy are deeply intertwined, insofar as they reflect a deep concern for the management and, where necessary, suppression of disagreement and conflict. This manifests itself in Hobbes's emphasis on demonstrative reasoning as a tool for commanding assent, which he hoped could be replicated also in the realm of civil philosophy. But, ironically, Hobbes's own forays into the demonstrative sciences—notably, his repeated claims to have squared the circle—were marred by controversy and led to a long-standing feud between Hobbes and some of the leading mathematicians of his time. What explains Hobbes's stubbornness in the face of severe criticism from established experts? As I shall argue, Hobbes could not easily have given up his core beliefs about geometry without, in his view, threatening its value as a methodological archetype of demonstrative reasoning. Yet, in conflating his own grasp of geometrical knowledge with his insight into the importance of the geometrical method, Hobbes came dangerously close to instantiating the very social condition he most deplored: 'when men that think themselves wiser than all others, clamor and demand right Reason for judge, yet seek no more, but that things should be determined, by not other mens reason but their own.'

## Introduction

While Thomas Hobbes's standing as a political thinker is beyond dispute, his writings on matters of natural philosophy and knowledge as *scientia* have garnered considerably less attention. Recent Hobbes scholarship seems to have restored the balance somewhat, yet his epistemology and philosophy of science continue to be viewed, more often than not, through the lens of his politics.



In the present paper, I argue that the practical and theoretical parts of his philosophy are indeed deeply intertwined, but not in the way that is sometimes assumed. What unites the two is a deep concern for the management and, where necessary, suppression of disagreement and conflict. Specifically, I will be looking at Hobbes's emphasis on demonstrative reasoning—most manifest in the case of Euclidean geometry—as a tool for commanding assent. Achieving a similar degree of compellingness in the case of civil philosophy became a standing concern of Hobbes's mature philosophy, even if the source of authority would have to differ considerably in character. Ironically, Hobbes's forays into the science of geometry—in particular, his repeated claims to have succeeded in squaring the circle—would turn out to become a major source of controversy, not consensus, and gave rise to a longstanding feud between Hobbes and some of the leading mathematicians of his time, notably John Wallis, the Savilian professor of geometry at Oxford.<sup>1</sup>

Much of this paper draws on existing strands in contemporary Hobbes scholarship, and there would be little point in my hoping to add to the detailed historical analyses that have been offered in recent years, e.g. on the relation between Hobbes and the humanist tradition,<sup>2</sup> his dispute with Robert Boyle over the status of experiment,<sup>3</sup> or on the 'war' between Hobbes and Wallis.<sup>4</sup> The goal of this paper is not to propose a novel interpretation of the substance of Hobbes's epistemology or philosophy of science, but instead to offer a reassessment of certain aspects of Hobbes's philosophical *strategy*, in the hope of contributing to a better understanding of his overall philosophical project. Furthermore, it is my hope that, by relating seemingly disparate parts of Hobbes's oeuvre (each of which has so far been studied separately) to one another—in particular, his writings on geometry and his political philosophy—it will be possible to shed light on some residual interpretative puzzles that afflict his philosophical approach. Finally, by giving a gloss on the

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1 For a short survey of the dispute, see Probst S., "Infinity and Creation: the Origin of the Controversy Between Thomas Hobbes and the Savilian Professors Seth Ward and John Wallis", *British Journal for the History of Science* 26 (1993) 271–279; for an in-depth monograph that discusses both the historical background and the finer mathematical points, see Jessephe D., *Squaring the Circle: The War between Hobbes and Wallis* (Chicago: 1999). The present paper goes beyond these surveys by arguing for a convergence between the theoretical and argumentative strategies in Hobbes's theoretical and practical philosophy, both of which give primacy to strategies for the management and suppression of disagreement and conflict.

2 Skinner Q., *Reason and Rhetoric in the Philosophy of Hobbes* (Cambridge: 1996).

3 Shapin S. – Schaffer S., *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: 1985).

4 Jessephe, *Squaring the Circle*.

undoubtedly complex relationship between Hobbes's life and his work, I hope to make some headway towards making sense of a salient feature of Hobbes's philosophical life that has continued to perplex even his most sympathetic interpreters: his stubbornness in the face of controversy.

### Hobbes: His Life and Times

Thomas Hobbes lived through what was, at many levels, a period of strife and controversy. Indeed, it would be hardly an exaggeration to speak of 'a life of controversy'—especially since Hobbes's own participation in intellectual controversies became ever more salient as his life progressed. Born in Wiltshire, just outside the town of Malmesbury, on the morning of Good Friday in 1588, Hobbes would live to the almost Biblical age of very nearly 92. His father was a minor clergyman, his mother a farmer's daughter; as Hobbes was eager to recall, he was born prematurely—a fact he blamed on his mother's rumour-induced fear of a Spanish invasion (a threat that was only averted by England's victory over the Armada later that summer). Following a grammar school education, where he mastered Latin and Greek, he went up to Oxford at the age of barely fifteen, furthering his studies in what was essentially a humanist literary curriculum. After graduating in 1608, Hobbes was recommended to the family of the First Earl of Devonshire as a tutor to their son, an affiliation that was to continue throughout his life. The duties of a tutor brought with them the opportunity to travel extensively, as part of the *grand tour* that was an essential part of the education of every young English aristocrat. By the time civil war erupted in England in 1642, after many years of political turmoil, Hobbes had completed three such journeys to the Continent, the first in 1610–1615, the second—during which he (re)discovered for himself Euclid's *Elements* (see below)—from 1628 to 1631, and the final one in 1634–1637; soon after his return to England from the third tour, and following the circulation of early manuscripts of his *Elements of Law* (not published until 1889), Hobbes, fearing the hostility of the parliamentary forces, was forced into exile in Paris. For the next eleven years, Hobbes would devote himself to natural and political philosophy, developing more fully his systematic philosophy, the overall structure of which—including the envisaged threefold division into questions of nature (*De corpore*), man (*De homine*) and politics (*De cive*)—was already in place by the late 1630s.

Hobbes's first published work, in 1629, was a translation of Thucydides' *Eight Books of the Peloponnesian War*. What on the face of it might look like a straightforward exercise in humanistic scholarship—the translation of a clas-

sic text written by a famous author—already foreshadows many of Hobbes's later philosophical concerns. Thucydides, for Hobbes, represents historiography at its best, not least since he always keeps in mind the principal aim of history—namely, as Hobbes puts it in his Preface, 'to instruct and enable men by the knowledge of actions past, to bear themselves prudently in the present and providently towards the future.'<sup>5</sup> The philosophical significance of Hobbes's translation, or rather the preface that accompanied it, has been disputed, with some commentators noting that Hobbes appears to be putting words in Thucydides' mouth, when he claims that, of the various forms of government, Thucydides 'least of all liked the democracy'.<sup>6</sup> However, as Jonathan Scott points out, Hobbes is less concerned with adjudicating between different forms of government than with 'the causes of political instability and war',<sup>7</sup> and his understanding of the latter shows considerable continuity over time. Hobbes is especially impressed with Thucydides' account of 'the emulation and contention of the demagogues for reputation and glory of wit'<sup>8</sup> and with the detrimental effect this had on Athenian democracy:

with their crossing of each others counsels, to the damage of the public; the inconstancy of resolutions, caused by the diversity of ends and power of rhetoric in the orators; and the desperate actions undertaken upon the flattering advice of such as desired to attain, or hold what they had attained, of authority and sway amongst the common people.<sup>9</sup>

Hobbes's own exercise in translating and interpreting the ancients, thus, points to an intrinsic danger of a political tradition that was characterised by an over-reliance on rhetoric, sophistry and mere persuasion. When Thucydides, in his account of the revolution at Corcyra, laments that 'words had to change their ordinary meaning and to take that which was now given them' and that 'the use of fair phrases to arrive at guilty ends was in high reputation' (in Crawley's translation), this must have struck a chord with Hobbes in his capacity as an observer of the duplicitous nature of the politicking between Charles I and his parliaments. Indeed, in the *Leviathan*, Hobbes echoes Thucydides' complaint

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5 Hobbes T., *The History of the Grecian War. Written by Thucydides, translated by Thomas Hobbes of Malmesbury, to which is added a Survey of the History. New edition* (London: 1822) v.

6 Ibidem xii.

7 Scott J., "The Peace of Silence: Thucydides and the English Civil War", in Rogers G.A.J. – Sorell T. (eds.), *Hobbes and History* (London: 2000) 117.

8 Hobbes, *The History of the Grecian War*, xii.

9 Ibidem.

when he reflects on 'that art of words, by which some men can represent to others, that which is Good, in the likenesse of Evill; and Evill, in the likenesse of Good'.<sup>10</sup>

In the 'state of nature'—which, for Hobbes, played a dual role, as 'both a description of dire political possibility and an ingenious methodological device'<sup>11</sup>—moral and political vocabulary has lost its meaning. As Hobbes puts it:

To this warre of every man against every man, this is also consequent; that nothing can be Unjust. The notions of Right and Wrong, Justice and Injustice have there no place.<sup>12</sup>

In the absence of a source of normative authority, enforceable criteria of right and wrong can no longer exist, and conceptual confusion and a breakdown of communication as a means of social coordination are inevitable. In modern times, a return to such initial conditions becomes a serious possibility whenever civil war threatens to undermine social authority. Authority about conceptual matters, however, can not only be destroyed by external factors, such as social unrest, but can also be gradually eroded 'from within'. Philosophers, more often than not, share part of the blame, for 'there can be nothing so absurd, but may be found in the books of Philosophers.'<sup>13</sup> By refusing to define their terms, instead indulging in the 'copiousnesse of language',<sup>14</sup> philosophers find themselves 'entangled in words', unable to contribute to 'any progress in the knowledge of the truth'.<sup>15</sup> Philosophical doctrines thus arrived at are no better than 'the frivolous Distinctions, barbarous Terms, and obscure Language of the Schoolmen'.<sup>16</sup> In his conclusion to the discussion of reason and science in the *Leviathan*, Hobbes brings out with great clarity what he sees as the only

10 Hobbes T., *Leviathan*, ed. R. Tuck, 2nd ed. (Cambridge: 1996) 2.17.

11 Ball T., "Hobbes' Linguistic Turn", *Polity* 17 (1985) 739–760, here 749.

12 Hobbes, *Leviathan* 1.13.

13 Ibidem 4.46.

14 Ibidem 1.4.

15 Hobbes T., *De cive*, Epistle Dedicatory, in *The English Works of Thomas Hobbes of Malmesbury*, ed. Sir W. Molesworth [11 vols.], reprint in 12 vols. (London: 1992) vol. 11, 3. For a historical perspective on the use of rhetorical principles issuing in the charge of incomprehensibility, see Fritz G., "Communication Principles for Controversies: A Historical Perspective", in van Eemeren F.H. – Garssen B. (eds.), *Controversy and Confrontation: Relating Controversy Analysis with Argumentation Theory* (Philadelphia: 2008) 109–124.

16 Hobbes, *Leviathan* 4.47.

alternative to conceptual obscurantism, viz. a civil philosophy, grounded in exact definitions and augmented through genuine (scientific) method:

The Light of humane minds is Perspicuous Words, but by exact definitions first snuffed, and purged from ambiguity; *Reason* is the *pace*; Encrease of *Science*, the *way*; and the Benefit of man-kind, the *end*. And on the contrary, Metaphors, and senseless and ambiguous words, are like *ignes fatui*; and reasoning upon them, is wandering amongst innumerable absurdities; and their end, contention, and sedition, or contempt.<sup>17</sup>

In order to be able to dislodge the confused frameworks of thinking that still enthralled the masses and inflamed their passions, civil philosophy and moral science require the backing of the sovereign—who, in turn, retains the right to judge which doctrines are fit for peace and should be administered to his subjects: ‘It belongeth therefore to him that hath sovereign power, to be Judge, or constitute all Judges of Opinions and Doctrines, as a thing necessary to peace, thereby to prevent Discord and Civill War.’<sup>18</sup>

The publication of *Leviathan* in 1651 immediately pitted much of the learned public against Hobbes. His vigorous defence of consolidating civil and ecclesiastical authority into one undivided supreme authority, paired with a thoroughgoing materialism, was guaranteed to offend many parties at the same time—and also upset many of those who had come to respect Hobbes as a reputable man of letters and, importantly, scientist.<sup>19</sup> The former doctrine was unacceptable to those who denied that a civil sovereign could have authority over religious matters, the latter—more specifically, Hobbes’s denial of the possibility of immaterial substances—was deemed by many to lead straight to atheism (‘Deny spirits, and you are an atheist’)<sup>20</sup> and was thus anathema to the religious sensibilities of most. An interesting case—one that will feature again later in this paper—is that of Seth Ward, who was appointed to the Savilian Chair of Astronomy at Oxford in 1649. Initially somewhat supportive of Hobbes—he contributed the “publisher’s preface” to Hobbes’s 1650 treatise *Humane Nature* (the first part of *The Elements of Law*), according its author

17 Ibidem 1.5.

18 Ibidem 2.18.

19 For the high esteem enjoyed by Hobbes as a scientist before the 1650s, see Malcolm N., “Hobbes and the Royal Society”, in Rogers G.A.J. – Ryan A. (eds.), *Perspectives on Thomas Hobbes* (Oxford: 1988) 43–66.

20 Aubrey J., ‘*Brief Lives*’, chiefly on *Contemporaries*, set down by John Aubrey between the Years 1669 & 1696, ed. A. Clarke, 2 vols. (Oxford: 1898), vol. II, 318.

a place among 'men conversant in demonstration'<sup>21</sup>—he became a staunch opponent following the publication of *Leviathan*, not just because he rejected Hobbes's now much more explicit materialism, but also because he regarded Hobbes as a dangerous educational reformer, who posed a threat to the traditional influence of the universities.

### Science, Motion, and Mind

At the heart of Hobbes's civil philosophy is a thoroughgoing materialist epistemology: all that we can reasonably hope to learn must be the result of careful scientific study, and science itself must be based, first and foremost, on clear and agreed-upon definitions, from which causal and demonstrable inferences may then be drawn by way of 'resolutive-compositive' reasoning. Where demonstrable knowledge is possible, as in geometry, the 'truth of the first principles of our ratiocination, namely definitions, is made and constituted by ourselves, whilst we consent and agree about the appellations of things.'<sup>22</sup> Definitions come in two kinds, 'the first of which merely indicates the nature of the thing, while the second explains the cause or means of generation.'<sup>23</sup> While the first kind is stipulative in character, and thus a matter of convention (though not necessarily perceived as arbitrary by us), the second kind—causal definitions—are the source of true *scientia*:

The end of science is the demonstration of the causes and generations of things; which if they be not in the definitions, they cannot be found the conclusion of the first syllogism, that is made from those definitions; and if they be not in the first conclusion, they will not be found in any further conclusion deduced from that; and therefore, by proceeding in this manner, we shall never come to science; which is against the scope and intention of demonstration.<sup>24</sup>

21 Hobbes, *English Works* vol. IV, xi.

22 Hobbes Thomas, *Concerning body* 4.25, in *English Works* vol. I, 388.

23 Hobbes Thomas, *Thomae Hobbes Malmesburiensis Opera Philosophica Quae Latine Scripsit Omnia in Unum Corpus Nunc Primum Collecta* (Amsterdam, Joan Blaeu: 1668), vol. IV, 156; quoted after Jesseph D., "Scientia in Hobbes", in Sorell T. – Rogers G.A.J. – Kraye J. (eds.), *Scientia in Early-Modern Philosophy: Seventeenth-Century Thinkers on Demonstrative Knowledge from First Principles* (Dordrecht: 2010) 117–127.

24 Hobbes, *Concerning body* 1.6, in *English Works* vol. I, 82–83.

Hobbes's category of 'causes and generations of things' is an inclusive one, which also extends to objects that would not nowadays be thought of as 'effects'. Thus, early on in *De Corpore*, Hobbes gives the construction of a circle as an example of '[h]ow the knowledge of any effect may be gotten from the knowledge of the generation thereof':<sup>25</sup>

For let it be known that the figure was made by the circumduction of a body whereof one end remained unmoved, and we may reason thus; a body carried about, retaining always the same length, applies itself first to one *radius*, then to another, to a third, a fourth, and successively to all; and, therefore, [...] that from such generation proceeds a figure, from whose one middle point all the extreme points are reached unto by equal *radii*. And in like manner, by knowing first what figure is set before us, we may come by ratiocination to some generation of the same, though perhaps not that by which it was made, yet that by which it might have been made.<sup>26</sup>

Science based on 'the demonstration of the causes and generations of things' thus has an undeniably constructive element for Hobbes, but this does not render his philosophy of science conventionalist, as has sometimes been wrongly assumed.<sup>27</sup>

Whereas in geometry, science allows us to aspire to the ideal of demonstrable certainty, in our investigations of natural phenomena we need to be more modest—precisely because the fundamental principles of nature are not generated by us. Physics, and the study of phenomena of nature in general, 'depends upon hypotheses; which unless we know them to be true, it is impossible for us to demonstrate that those causes, which I have there explicated, are the true causes of the things whose productions I have derived from them'.<sup>28</sup> All we can hope—and indeed should aim—for in 'physical contemplation' is a demonstration of what true causes there *may* be: 'But because of natural bodies we know not the construction, but seek it from the effects, there lies no demonstration of what the causes be we seek for, but only of what they may

25 Ibidem 1.5, in *English Works* vol. 1, 6.

26 Ibidem.

27 For a robust defence of Hobbes's non-conventionalism, see Jesseph, "Scientia in Hobbes" 125.

28 Hobbes, *Concerning body* 4.30, in *English Works* vol. 1, 531.



be'.<sup>29</sup> This, however, does not mean that investigation of natural phenomena is futile, since we can at least have certainty about their ultimate, most general source—which is the same as that of universal things ('of those, at least, that have any cause'):

for they have all but one universal cause, which is motion. For the variety of all figures arise out of the variety of those motions by which they are made; and motion cannot be understood to have any other cause besides motion.<sup>30</sup>

Just as going through the motions of their construction allows us not merely to *visualize* geometrical objects, but in effect to retrace how they originate from motion ('lines are not drawn but by motion, and motion is of body only'),<sup>31</sup> so physical phenomena, too, can be seen to be, in their final analysis, nothing but the result of bodies in motion.

Famously—and, in the eyes of many of his contemporaries, notoriously—Hobbes's 'science of motion' does not end with the analysis of physical phenomena, but also extends to human sensation, the life of mind, and—eventually—the body politic. One must, however, be careful not to interpret Hobbes's project as simply 'exporting' the mechanical model of motion 'into biological and social analyses',<sup>32</sup> thereby reducing life to nothing 'but a motion of limbs', devoid of all purposiveness other than brute self-preservation. For Hobbes, 'motion' *includes* physical motion (which, more often than not, serves as an excellent analogy for heuristic purposes), but it also includes, for exam-

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29 Hobbes Thomas, *Six Lessons to the Professors of the Mathematicques, one of Geometry, the other of Astronomy: In the Chaires set up by the Noble and Learned Sir Henry Savile, in the University of Oxford* (London, Andrew Crooke: 1656), in *English Works*, vol. VII, 184. Some commentators have overplayed the hypothetical character of such inquiry in Hobbes. Thus Michael Oakeshott claims that '[f]rom beginning to end there is no suggestion in Hobbes that philosophy is anything other than conditional knowledge, knowledge of hypothetical generations and conclusions about the names of things, not about the nature of things.'—Oakeshott M., *Hobbes on Civil Association* (Indianapolis: 2000) 26. However, as Robert Miner notes, Hobbes 'is not quite so definite' on this point and, on occasion, is happy to collapse the distinction between hypothetical and actual generation. See Miner R., *Truth in the Making: Knowledge and Creation in Modern Philosophy and Theology* (London: 2004) 91.

30 Hobbes, *Concerning body* 1.6, in *English Works* vol. I, 69.

31 Hobbes, *Six Lessons* in *English Works* vol. VII, 211.

32 Spragens T., *The Politics of Motion: The World of Thomas Hobbes* (London: 1973) 69.



ple, psychological endeavours such as motives and desires,<sup>33</sup> which are themselves shaped by experience, but which may nonetheless influence action in a goal-directed manner.<sup>34</sup> In his *Humane Nature* (1650), Hobbes concludes that

*whatsoever accidents or qualities our senses make us think there be in the world, they be not there, but are seemings and apparitions only; the things that really are in the world without us, are those motions by which these seemings are caused.*<sup>35</sup>

While, on the face of it, this account of how things are ‘in the world *without us*’ seems compatible with an immaterialistic conception of the human mind, Hobbes had, of course, already dismissed dualism, having previously rejected Descartes’s inference from the *cogito* to an immaterial mind as the essence of the self’s existence. As he notes, in his *Objections to Descartes’ Meditations*:

For it does not seem a valid argument to say “I am thinking, therefore I am a thought” or “I am understanding, therefore I am an understanding”. For in the same way I could just as well say: “I am walking, therefore I am an act of walking”.<sup>36</sup>

Such reification of processes of the mind—that is, of constellations of bodies in motion—comes naturally, but philosophical exceptionalism about the workings of the human mind, for Hobbes, had no more validity than vulgar belief in ghosts and fairies, which were likewise reifications of the imagination. Neither is compatible with Hobbes’s doctrine that, in a commonwealth, humans—animated bodies—submit to, and can know from experience that they must submit to, an ‘artificial body’ endowed with coercive power to restrain the movements and interactions of the former (this being necessary because ‘unless they be restrained by some power, they will always be making war upon one another’<sup>37</sup>). Hobbes’s endorsement of materialism, along with

33 See Barnouw J., “Hobbes’s Psychology of Thought: Endeavours, Purpose and Curiosity”, *History of European Ideas* 10 (1989) 519–545.

34 As Jeffrey Barnouw has argued, it is this aspect of Hobbes’s ‘science of motion’ which opens up ‘the capacity for self-regulation in thinking and in deliberative desire’ (Barnouw, “Hobbes’s Psychology of Thought” 531).

35 Hobbes, *Elements of Law* 1.2.10 in *English Works* vol. VI, 8.

36 Quoted after Descartes René, *Meditations, Objections and Replies*, ed. and trans. R. Ariew – D. Cress (Cambridge, MA: 2006) 101.

37 Hobbes, *Concerning body* I.6, in *English Works* vol. I, 74.

his denial of the immateriality (and hence of the immortality) of the soul, was taken by his contemporaries to be a sign of atheism. Hobbes, in his *Epistle*, predicted that those parts of *Leviathan* would cause the most offence that contain ‘certain Texts of Holy Scripture, alledged by me to other purpose than ordinarily they use to be by others.’ At the same time, he went out of his way (e.g., in the 1668 Appendix to the Latin version of the *Leviathan*) to demonstrate that his account was not only compatible with central elements of the Bible, but in many instances corresponded more closely to its literal meaning than the bastardized theology that had fused together scriptural doctrines with the ‘Vain Philosophy of Aristotle.’<sup>38</sup>

### Squaring the Circle

Not only was Hobbes’s moral character in the eyes of the public called into question by his alleged atheism, his reputation as a man of science also suffered setbacks, at least among certain segments within the academic elite—most notably through a series of (often petty) disputes with leading mathematicians of his time. It did not help that his opponents in some of those scientific disputes were the very same people—notably, the Savilian Professors Seth Ward and John Wallis—who also took issue both with Hobbes’s unorthodox (minimalist) views on religion and, perhaps more importantly, with his ambitious programme of educational reform, according to which the universities needed to be disciplined and purged of all seditious doctrines concerning the source of sovereignty and the rights of the sovereign. A good illustration of how the two lines of criticism intersected is a letter by Wallis to Huygens in January of 1659, in which the former explains his ‘harsh diatribe against Hobbes’:

But this was provoked by our Leviathan [...], when he attacks with all his might and destroys our universities (and not only ours, but all, both old and new), and especially the clergy and all institutions and all religion. As if the Christian world knew nothing sound or nothing that was not ridiculous in philosophy or religion; and as if it has not understood religion because it does not understand philosophy, nor philosophy because it does not understand mathematics. And so it seemed necessary that now some mathematician, proceeding in the opposite direction, should

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38 Hobbes, *Leviathan* 4.46.

show how little he understands this mathematics (from which he takes his courage).<sup>39</sup>

Elsewhere, Wallis refers to Hobbes as a 'pseudo-geometer' and to his work as 'a shitten piece', prompting Hobbes—who was no stranger to invectives—to complain that 'such words as these do not become a learned mouth, much less are fit to be registered in the public writings of a doctor of divinity'.<sup>40</sup>

The majority view among historians traces the outbreak of the dispute to the 1654 publication of Ward's *Vindiciae academiarum*, a defence of the established university system against attacks by the puritan educational reformer John Webster, which also included, as an appendix, a rebuttal of Hobbes's reformist ideas. If the origin of the animosity between Hobbes and his mathematical critics was largely ideological in character, what was the nature of their mathematical dispute?<sup>41</sup> Hobbes's *De Corpore*, published in 1655, contained a series of bold mathematical assertions which amounted to the claim that, by way of right demonstration, and on the basis of his 'principles of ratiocination', Hobbes had been able 'to square the circle, rectify curvilinear arcs, and solve other outstanding geometrical problems'; in short, Hobbes claimed to have furnished 'some of the most eagerly sought geometrical results of the seventeenth century'.<sup>42</sup> Wallis responded promptly with the publication of his *Elenchus Geometriae Hobbiana* (1655), in which he not only pointed out numerous technical errors that rendered most of Hobbes's demonstrations unsound (despite Hobbes's frantic attempt to include last-minute corrections, even as the manuscript was already at the printer's), but also called into question Hobbes's overall conception of geometry as well as the style of his presentation. Addressing the author of *De Corpore* directly, he writes:

What need is there for this whole apparatus you have, and for so many interspersed paralogsms and other suppositions which have nothing sound about them, in order to prove a thing so easy, and which no man would ever doubt? Unless perhaps someone had come across it in your demonstration, and seeing so many false and putrid things in it, he

39 Wallis to Huygens, 1/11 January 1659, quoted after Jesseph, *Squaring the Circle* 70.

40 For an admirably detailed and lucid account of the conflict between Hobbes and Wallis, see Jesseph, *Squaring the Circle*; for an excursus into the scatological dimension of their dispute, see Martinich A.P., *Hobbes: A Biography* (Cambridge: 1999) 290–292.

41 The following reconstruction of the dispute between Hobbes and Wallis relies heavily on Jesseph, *Squaring the Circle* 10–11.

42 Jesseph, *Squaring the Circle* 11.

should assume that anything needing such things for proof must contain something wrong.<sup>43</sup>

Among the results that did not stand up to scrutiny was Hobbes's attempted quadrature of the circle. Wallis recounts at some length how Hobbes gradually had to recant his earlier boastful claims, noting that, time and again, Hobbes was forced to respond to valid criticisms: 'after first, second, and third revisions, you print it a first, second, and third time: in the end you dexterously admit that you have by no means brought forth what you had promised; and then you ask that these things be taken "as said problematically"'.<sup>44</sup>

Contemporary Hobbes scholarship for the most part considers Hobbes's foray into geometry, and his obstinacy in the face of mathematical controversy, a mild embarrassment. Thus, G.A.J. Rogers refers to the quarrel over the possibility of squaring the circle as 'a debate that Hobbes would have done well not to join';<sup>45</sup> Floridi laments Hobbes's 'total and embarrassing failure', which 'completely destroyed Hobbes's reputation as a mathematician';<sup>46</sup> Joseph F. Scott, in his study of Wallis's mathematical works, speaks of an altogether 'deplorable affair',<sup>47</sup> which could do nothing but harm the reputation of everyone involved. It would be anachronistic, however, to dismiss Hobbes's attempts to square the circle—and there were many—as obviously misguided: after all, the proof that  $\pi$  is a transcendental number—and thus not a member of the set of magnitudes that lend themselves to geometrical construction—was only given in 1882 by the German mathematician Carl Louis Ferdinand von Lindemann. Neither was Hobbes the only geometer of his time who attempted the quadrature of the circle, nor was there widespread pessimism regarding the possibility of finding a solution to the elusive problem.<sup>48</sup> It was not Hobbes's ambition *per se*, but the sloppy execution of his attempted construc-

43 Wallis John, *Elenchus Geometriae Hobbiana, sive, Geometricorum, quae in 'Elementis Philosophiae', à Thoma Hobbes Malmesburiensi proferuntur, Refutatio* (Oxford, H. Hall for John Crooke: 1655) 63; quoted after Jessep, *Squaring the Circle* 112.

44 Wallis, *Elenchus* 3; quoted after Jessep, *Squaring the Circle* 129.

45 See Rogers's introduction to Hobbes, *English Works* vol. I, vi.

46 Floridi L., "Mathematical Skepticism: The Debate between Hobbes and Wallis", in Neto J.R.M. – Popkin R.H. (eds.), *Skepticism in Renaissance and Post-Renaissance Thought: New Interpretations* (New York: 2004) 155.

47 Scott J.F., *The Mathematical Work of John Wallis* (London: 1938) 166.

48 For a (by now dated) history of the problem, see Hobson E.W., *Squaring the Circle: A History of the Problem* (Cambridge: 1913). In the popular imagination, the attempt to 'square the problem' had long been regarded as pointless, e.g. in the comical figure of the astronomer Meton in Aristophanes's *The Birds*.

tions—and the assertive manner in which he presented even results that could at best be described as preliminary—which irritated his more mathematically accomplished colleagues.

Before inquiring into how Hobbes's 'obsessive interest in geometry'<sup>49</sup> can be squared with his philosophical project more generally, it is worth pointing out another disagreement between Hobbes and the prevailing opinion among mathematicians of his time, regarding the relation between geometry and algebra. Hobbes profoundly abhorred the proliferation of symbolic notation in mathematics—so much so that one recent biographer conjectured that Hobbes may have suffered from 'symbol anxiety'.<sup>50</sup> Hobbes objected to the use of algebra not merely on aesthetic grounds—complaining at one point that a page filled with algebraic notation looked 'as if a hen had been scraping here'<sup>51</sup>—but for reasons similar to those that motivate his rejection of the unconstrained (and, hence, potentially inflammatory) use of language, especially in the absence of proper definitions. Just as the latter is liable to give rise to conceptual confusion and instability, so is excessive reliance on symbolic notation in mathematics, which only imposes on us 'a double labour of the mind, one to reduce your symbols to words, which are also symbols, another to attend to the ideas which they signify.'<sup>52</sup> The result of algebra's over-reliance on symbols, Hobbes seems to think, is a self-referential system of thought that is becoming dissociated from human experience at an ever faster pace:

I never saw anything added thereby to the science of geometry, as being a way wherein men go round from the equality of rectangled planes to the equality of proportion, and then again to the equality of rectangled planes, wherein the symbols serve only to make men go faster about, as greater wind to windmill.<sup>53</sup>

Hobbes did not realise the extent to which algebra afforded new avenues of mathematical thinking, equating it instead with arithmetic (which had no place in geometry) and dismissing it as, at best, shorthand for 'proper' geometrical reasoning, and in many cases a tool for conceptual obfuscation. As such, it invited Hobbes's suspicion, much as the 'frivolous distinctions' and 'barbarous terms' of the scholastics did. As Jesseph puts it with regard to the

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49 Floridi, "Mathematical Skepticism" 155.

50 Martinich, *Hobbes* 283.

51 Hobbes, *Six Lessons in English Works* vol. VII, 330.

52 Ibidem vol. VII, 329.

53 Ibidem, Epistle dedicatory, vol. VII, 188.

latter, Hobbes was 'unique in seeing Scholastic obscurantism as productive of social disorder, rather than simply confusion, error, or bad philosophy',<sup>54</sup> and he directed much of the same sentiment at the nascent algebraic approach which 'ought no more to appear in public, than the most deformed necessary business which you do in your chambers.'<sup>55</sup>

### The Euclidean Turn: A Puzzle

In what is almost certainly an embellished story, Aubrey recounts how, during one of his trips to the Continent in 1628, Hobbes encountered Euclid's writings on geometry:

Being in a Gentleman's Library, Euclid's Elements lay open, and 'twas the 47 el. *libri* 1 [= the Pythagorean theorem]. He read the Proposition. By G—, sayd he (he would now and then swear an emphaticall Oath by way of emphasis) *this is impossible!* So he reads the Demonstration of it, which referred him back to such a Proposition; which proposition he read. That referred him back to another, which he also read. *Et sic deinceps* [and so forth] that at last he was demonstratively convinced of that trueth. This made him in love with Geometry.<sup>56</sup>

Some contemporary Hobbes scholars point out that it would be remarkable if Hobbes had never been exposed to the basics of the Euclidean method during his education at Westport and Oxford; others<sup>57</sup> have noted that a list of some 900 titles—more than a hundred of them on geometry—may refer to books in Hobbes's possession at some point between 1625 and 1628 (though others have disputed this attribution, arguing instead that the list was drawn up by Robert Payne).<sup>58</sup> Whether or not Hobbes had really only become impressed with Euclid at the age of 40 is immaterial; either way, geometry became a cen-

54 Jesseph, *Squaring the Circle* 61.

55 Hobbes, *Six Lessons in English Works*, vol. VII, 248.

56 Aubrey, *Brief Lives* vol. I, 332, quoted after Grant H., "Hobbes and Mathematics", in Sorell T. (ed.), *The Cambridge Companion to Hobbes* (Cambridge: 2006) 108–128, here 111.

57 E.g. Pacchi A., "Una 'biblioteca ideale' di Thomas Hobbes: Il ms E2 dell'Archivio di Chatsworth", *Acme* (1968) 5–42.

58 See Malcolm N., "Biographical Register of Hobbes's Correspondents", in *The Correspondence of Thomas Hobbes*, ed. N. Malcolm, 2 vols. (Oxford: 1994) 777–919, and Skinner, *Reason and Rhetoric* 250, fn. 3.

tral intellectual concern for him. By one estimate, some 27 percent of Hobbes's total written output was on the topic of mathematics,<sup>59</sup> and so great was Hobbes's enthusiasm for geometrical demonstration that, as Aubrey recounts, he was 'wont to draw lines on his thigh and on the sheets, abed, and also to multiply and divide.'<sup>60</sup>

The influence of the 'Euclidean turn' on Hobbes's thinking is omnipresent in his writings.<sup>61</sup> The joint ideals of reasoning '*more geometrico*' and giving it systematic expression—as Euclid did in his *Elements*—are evident in his trilogy of *De Corpore*, *De Homine*, and *De Cive*, which together form Hobbes's *Elements of Philosophy*. The Euclidean ideal had, of course, been already invoked in the title of his first systematic treatment of civil science, *The Elements of Law*.<sup>62</sup> In *Leviathan*, Hobbes described geometry as 'the onely Science that it hath pleased God hitherto to bestow on mankind'<sup>63</sup> Despite minor quibbles with Euclid, for example over geometrical definitions—Hobbes rejected Euclid's definition of a line as a 'breadthless length', on the grounds that 'lines are not drawn but by motion, and motion is of body only'<sup>64</sup> and hence cannot lack width—he took it that the foundations of geometry had essentially been completed:

I thought to admonish the reader, that before he proceed further, he take into his hands the works of Euclid, Archimedes, Apollonius, and other as well ancient as modern writers. For to what end is it, to do over again that which is already done?<sup>65</sup>

59 Breidert W., "Les mathématiques et la méthode mathématique chez Hobbes", *Revue Internationale de Philosophie* 129 (1979) 415–432, here 416.

60 Aubrey, 'Brief Lives' 159.

61 Some authors, e.g. Perez Zagorin in the dispute over the authorship of the *Short Tract*, have even relied on the 'geometric form, consisting of the statement of principles resembling axioms and of deductive conclusions that include demonstrations with the help of diagram', as a tell-tale sign of Hobbes's authorship at the time. See Zagorin P., "Hobbes's Early Philosophical Development", *Journal of the History of Ideas* 54 (1993) 505–518, here 511.

62 As Skinner emphasises, it is worth keeping in mind that the original title of Billingsley's 1571 translation of Euclid's treatise was *The Elements of Geometry*. See Skinner, *Reason and Rhetoric* 298.

63 Hobbes, *Leviathan* 4.15, 28.

64 Hobbes, *Six Lessons in English Works* vol. VII, 211.

65 Hobbes, *Concerning body in English Works* vol. I, 204.



However, foundational work was still needed in another domain of science—indeed the *only* other domain that lent itself to demonstrable reasoning: that of *Civil Philosophy*. Hobbes draws a direct parallel between the (already well-established) science of geometry and civil philosophy, which he thought ‘no older [...] than my own book *De cive* [1642]’:<sup>66</sup>

Geometry therefore is demonstrable; for the Lines and Figures from which we reason are drawn and described by our selves; and Civill Philosophy is demonstrable because, we make the Commonwealth our selves.<sup>67</sup>

In the intermediate realm of natural bodies, since ‘we know not the Construction’,<sup>68</sup> full demonstration is impossible; even so, ‘they that study natural philosophy, study in vain, except they begin at geometry’.<sup>69</sup>

Hobbes’s classification of the sciences into demonstrable and non-demonstrable, and his views on the corresponding division into different kinds of knowledge, is not without internal tension. While Leo Strauss has characterised the division merely as inconclusive,<sup>70</sup> others have noted that Hobbes’s characterisation of civil philosophy as a demonstrable science is better described as an overstatement; for civil philosophy, by necessity, ‘is based on a knowledge of “the motions of the mind” or “the dispositions and manners of men” [which] is either part of physics, or [...] is obtained by use of the reflective art of *nosce teipsum*, both of which make use of hypotheses’.<sup>71</sup> Is Hobbes then guilty of violating his own system of *scientia*? On the one hand, Hobbes’s conception of *scientia* draws on the Baconian tradition of thinking about certainty in terms of ‘maker’s knowledge’.<sup>72</sup> On the other hand, Hobbes makes clear that the demonstrable sciences are epistemically on a par with each other: ‘the certainty of all *scientiae* is equal, or else they would not be *scientiae*, since to know does not admit of greater or less’.<sup>73</sup> As Jesseph puts it, ‘the certainty of *scientia* is thereby purchased at the expense of foregoing any claim to *scientia* about those things we do not ourselves construct’.<sup>74</sup> In sum, this means that whatever certainty

66 Ibidem, Epistle dedicatory vol. I, ix.

67 Hobbes, *Six Lessons in English Works* vol. VII, 184.

68 Ibidem.

69 Hobbes, *Concerning body in English Works* vol. I, 73.

70 Strauss L., *The Political Philosophy of Hobbes: Its Basis and Its Genesis* (Chicago: 1952) 11.

71 Nerney G., “Hobbes: The Twofold Grounding of Civil Philosophy”, *History of Philosophy Quarterly* 2 (1985) 395–409, here 399.

72 Jesseph, “*Scientia* in Hobbes” 124.

73 Hobbes, *Opera Philosophica* vol. IV, 390; quoted after Jesseph, “*Scientia* in Hobbes” 125.

74 Ibidem.



civil philosophy has need not itself derive from the more basic sciences—i.e. geometry. Rather, in civil philosophy—as in geometry—we ‘no more but deduce the consequences of [our] own operation’,<sup>75</sup> yet that operation is not one of *reducing* questions of civil philosophy to an empirical study of the (constituent) motions of the mind; instead, it takes for granted as its starting point the recognition that the commonwealth is of man’s own making.<sup>76</sup>

Given Hobbes’s emphasis on the methodological ideal of geometry, and his ‘generative’ conception of knowledge—evident both in his indebtedness to the Baconian tradition and in his definition of philosophy as ‘the Knowledge acquired by Reasoning from the Manner of the Generation of any thing’<sup>77</sup>—it is obvious that Hobbes could not afford to be seen as being himself incapable of sound geometrical demonstration. If a persistent mismatch were to be found between what Hobbes’s system promised and what it could deliver—and it was clear that the burden of proof was on Hobbes—this would make a mockery of Hobbes’s project of establishing a demonstrable civil philosophy. His critics, as noted earlier, were well aware of the fact that, by calling into question Hobbes’s mathematical know-how, they could exploit this structural weakness of Hobbes’s framework. Thus, Ward wrote of Hobbes:

That he is sure he hath much injured the Mathematicks, and the very name of Demonstration, by bestowing it upon some of his discourses, which are exceedingly short of that evidence and truth which is required to make a discourse able to bear that reputation.<sup>78</sup>

Such criticism—in particular the implicit suggestion that Hobbes is chipping away at the very source of his authority by falsely labelling inconclusive arguments as ‘demonstrations’—threatened to strike at the core of Hobbes’s self-image.

And yet there remains a puzzling ambiguity about Hobbes’s level of commitment to the original geometry of Euclid and its status as a science. For all his apparent admiration of Euclid, Hobbes never showed much interest in

75 Hobbes, *English Works* vol. VII, 183.

76 On the generation of the commonwealth, and the parallel case of the generation of geometrical objects, see Pettit P., *Made With Words: Hobbes on Language, Mind, and Politics* (Princeton: 2008) 116–118.

77 Hobbes, *Leviathan* 4.46.; *English Works* vol. III, 664.

78 Ward Seth, *A Philosophicall Essay Towards an Eviction of the Being and Attributes of God, The Immortality of the Souls of Men, The Truth and Authority of Scripture* (Oxford, Lichfield: 1652) A3.

purely exegetical matters. When Hobbes professes in his prose *Vita* that he 'was delighted by Euclid's method', he adds that he subsequently studied his work diligently, 'not simply on account of its theorems, but also as a guide to the art of reasoning'.<sup>79</sup> Indeed, as noted earlier, on individual points of mathematical substance—including such fundamental definitions as those of a point or a line—he was prepared to 'correct' Euclid, so as to bring him in line with Hobbes's own philosophical commitments. Elsewhere, for example in *De Corpore*, Hobbes appears to get carried away by abstract analyses of various kinds of motion, including those that have no equivalent in nature. Not only do these derivations seem to owe at least as much to Galileo as to Euclid, they also convey, as Frithiof Brandt puts it,

a conspicuous lack of interest in mathematics as applied to motion as occurring in experience. [...] This is mathematically warrantable but seems strange in a philosopher who is driving at a mathematico-mechanical conception of Nature.<sup>80</sup>

Finally, there is the well-documented fact of Hobbes's haphazard attempts to salvage parts of *De Corpore*, by making various changes to the text—even as the book was being prepared for printing—after friends had pointed out serious flaws in several of his proofs. None of these aspects of Hobbes's own mathematical practice—including his calling into question the basic definitions of Euclid's system, his freely moving back and forth between pure and applied mathematics, and his hastily tweaking existing proofs—sits well with the image of someone whose main goal is the disinterested pursuit of mathematical truth. Some commentators have tried to explain Hobbes's erratic mathematical moves and his obstinacy in the face of controversy by his desire 'to establish his standing at the forefront of European mathematics'.<sup>81</sup> If this was indeed Hobbes's goal, then he appears to have hit all the wrong notes with his mathematical opponents. In the next section, I wish to argue that, real though Hobbes's mathematical ambitions were, they were not the only reason for his stubbornness. At least in part, his obstinacy can be explained by internal demands of his philosophical system; Hobbes, on pain of inconsistency, could simply not afford to back down without thereby admitting that the geometrical method—and, by extension, *scientia*—could not fulfil its proper theoretical role within his philosophical system.

79 Quoted after Skinner, *Reason and Rhetoric* 250.

80 Brandt F., *Thomas Hobbes' Mechanical Conception of Nature* (Copenhagen: 1928) 320.

81 Jesseph, *Squaring the Circle* 355.

### Hobbes's Politics of Epistemological Alignment

Various commentators have noted that Hobbes was fascinated with geometry not merely because of its mathematical content, but 'because of its epistemological consequences.'<sup>82</sup> For one, there is the element of self-sufficiency, insofar as geometry does not depend on any external resources for its truth—geometrical knowledge, one might say, is *self-generated*. An inquirer will quickly come to recognise this in the form of the plain compellingness of geometrical reasoning: 'once one enters the system of proof, its sheer internal coherence fashions the sense of a proposition's demonstrativeness.'<sup>83</sup> Geometry thus provides a model for Hobbes's project of conclusively establishing that other main body of 'artificial' knowledge, civil philosophy. However, Hobbes could have helped himself to the example of geometry as a model science without himself engaging in geometrical pursuits. While Hobbes's mathematical efforts have been ably reconstructed (see references in fn. 1 above), their significance—beyond the immediate context of Hobbes's political conflict with Ward and Wallis—and their contribution to his overall philosophical project has not been fully explored so far. The present paper attempts to address this lacuna, arguing that, through engaging in geometrical work himself, Hobbes is not merely concerned with giving an appraisal of the coherence and unity of an existing body of knowledge, but also with finding ways of avoiding (and, if necessary, suppressing) conflict. Recall that Hobbes asks his reader to judge the utility of civil philosophy 'not so much by the commodities we have by knowing these sciences, as by the calamities we receive from not knowing them'—chief among the latter 'the greatest calamities of mankind', civil wars.<sup>84</sup>

Subjective certainty, including the delight we take in establishing (or thinking through) complex patterns of demonstration, thus is subordinate to the primary function of demonstration, namely to reduce the potential for conflict—or so I wish to suggest. The view I am advocating resonates well with one side in the debate over Hobbes's relation to scepticism. For, unlike the sceptic, Hobbes does not take the fallibility of our sense perception *per se* to be the most pressing philosophical problem. After all, Hobbes is happy to grant 'that if the appearances be the principles by which we know all other things, we must needs acknowledge sense to be the principle by which we know those

82 Finn S., *Thomas Hobbes and the Politics of Natural Philosophy* (London: 2006) 107.

83 Silver V., "Hobbes on Rhetoric", in Sorell T. (ed.), *The Cambridge Companion to Hobbes* (Cambridge: 2006) 329–345, here 333.

84 Hobbes, *Concerning body* in *English Works* vol. 1, 10.

principles, and that all the knowledge we have is derived from it.’<sup>85</sup> Rather, it is the fact that fallibility results in disagreement, which may in turn provide fodder for the passions, which gives Hobbes cause for alarm. Indeed, *unwarranted* subjective certainty—which may be the result of lack of knowledge, or may be brought about by another’s eloquent manipulation—is likely to do more harm than any acknowledgment of the fallibility of our senses.<sup>86</sup>

In this context, it is worth recalling the anecdote (whether embellished or not) of Hobbes’s formative encounter with Euclid’s *Elements*. For Hobbes’s first impulse was to reject the theorem before him—‘By G—, it is impossible!’—yet upon being drawn in by the proof, and following the chain of demonstrative reasoning, he could not but admit its truth. Thus, Hobbes came to accept a piece of knowledge not because it initially struck him as self-evident, but because he was compelled to do so by the unrelenting rigour of the argument. The significance of the Euclidean method of demonstration thus resides in the fact that, as Hobbes sees it, it is the only method that has sufficient authority—once its definitions and foundational principles have been cleaned up and any residual ambiguity removed—to compel belief, even when our initial reaction is one of incredulity. It is this ability to induce agreement with a set of canonical truths which made the Euclidean method so attractive to Hobbes: ‘Here was a speech that could inexorably oblige us to see things a given way, in the face of no little resistance; and it was a revelation to him.’<sup>87</sup> Extending this strategy beyond the domain of geometry and applying it to civil philosophy thus held out the promise of successfully addressing the knowledge deficit—described by Hobbes as the fact ‘that men know not the causes neither of war nor peace’—which, as he sees it, lies at the heart of ‘all such calamities as may be avoided by human industry’.<sup>88</sup> Geometry, thus, was not only of intrinsic interest to Hobbes, but its success in generating new knowledge was, first and foremost, proof that the geometrical method was able to conclusively establish new (non-obvious) truths. What mattered for Hobbes’s project of establishing a demonstrative civil philosophy, was not so much the precise nature of the (mathematical) truths in question, but the manner in which their derivation commanded assent.

85 Hobbes, *Concerning body* IV. 25, in *English Works* vol. 1, 389.

86 On the relation between Hobbes’s acknowledgment of the fallibility of our senses and his antirealism about perceptual contents, see Corcilius K., “Thomas Hobbes”, in Perler D. – Haag J. (eds.), *Ideen. Repräsentationalismus in der frühen Neuzeit*, vol. 1 (Berlin: 2010) 119–131, here 121.

87 Silver, “Hobbes on Rhetoric” 332.

88 Hobbes, *Concerning body* 1.7, in *English Works* vol. 1, 8.

The contrast Hobbes draws between geometry and algebra is again instructive. Whereas the former is able to generate conclusive results since it engages ‘the things themselves’,<sup>89</sup> the latter can at best function as ‘brachygraphy’ (i.e., shorthand) of geometry. More often than not, however, excessive use of symbols will have detrimental effects:

I verily believe that since the beginning of the world, there has not been, nor ever shall be so much absurdity written in Geometry, as is to be found in those books of [Wallis]. [...] The cause whereof I imagine to be this, that he mistook the study of *Symboles* for the study of Geometry, and thought *Symbolicall* writing to be a new kinde of Method, and other mens Demonstrations set down in *Symboles* new Demonstrations.<sup>90</sup>

Not only is algebra ‘reinventing the wheel’, so to speak, but it is also guilty of interposing an additional—potentially disputable—layer of symbolic representation between the reasoner and the truth. Hobbes’s dismissal of the new algebraic approaches as ‘absurdities’ is thus of a piece with his criticism of the ‘privilege of Absurdity’, so often exploited by philosophers when they reason with meaningless general terms, whereby they ‘conceive nothing but sound’.<sup>91</sup> Yet even empty rhetoric is dangerous, as those who wield it often flatter themselves into believing that they are in possession of superior insight. The geometric method promises to cut through this Gordian knot, by proceeding from proper definitions and relying on proper ‘reckoning’; as Haig Patapan puts it, it offers ‘the rhetorical advantage of issuing in agreement, overcoming the blind intransigence of vanity.’<sup>92</sup>

Further support for the view that, for Hobbes, enforcing doxastic agreement as a precondition for civil peace takes priority over the pursuit of mathematical truth *simpliciter* may be gleaned from the fact that, should the two ever come into conflict, Hobbes would be prepared to sacrifice the latter:

For I doubt not, but that if it had been a thing contrary to any mans right of dominion, or to the interest of men that have dominion, *That the three Angles of a Triangle should be equall to two Angles of a Square*; that

89 Hobbes, *Opera Philosophica* vol. IV, 97; quoted after Jessephe, *Squaring the Circle* 245.

90 Hobbes, *Six Lessons in English Works* vol. VII, 188.

91 Hobbes, *Leviathan* 1.5, 19.

92 Patapan H., “‘Lord Over the Children of Pride’: The Vaine-Glorious Rhetoric of Hobbes’s *Leviathan*”, *Philosophy and Rhetoric* 33 (2000) 74–93, here 82.

doctrine should have been, if not disputed, yet by the burning of all books of Geometry, suppressed, as farre as he whom it concerned was able.<sup>93</sup>

There is an element of irony in Hobbes's conclusion that geometry, which provided the methodological model for civil philosophy, may itself be suppressed in the interest of conflict avoidance, if the sovereign—whose right of dominion is, of course, itself vindicated by civil philosophy—deems it necessary. Yet such trade-offs are only to be expected in the philosophical system of a thinker who values efficacy in ensuring civil peace at least as much as theoretical unity. Indeed, it has been noted that, in Hobbes's philosophy, 'there is a pattern of political influence that leads Hobbes to *accept* specific positions in natural philosophy that he has good scientific or logical reasons to *reject*',<sup>94</sup> and so it is perhaps not surprising that a similar pattern should resurface with respect to the question of which parts of *scientia* should be deemed publicly admissible (irrespective of their truth or logical priority).

I wish to conclude by offering two perspectives—one charitable, the other less so—on Hobbes's involvement in geometrical controversy. It may be tempting to think of Hobbes's behaviour as the result of a pursuit of mathematical truth gone awry, corrupted by an overwhelming desire, on Hobbes's part, to be recognised as a leading mathematician. This appears to be the dominant interpretation of Hobbes's mathematical ambitions, even among his more sympathetic commentators, and although not the most flattering portrayal of Hobbes the mathematician, much of this rings true. There is, however, a more charitable way of looking at this aspect of Hobbes, or so I wish to suggest. For, as I have indicated earlier, there is a sense in which Hobbes could not easily have given up his core beliefs about geometry without, in his view, compromising its value as a methodological archetype of demonstrative reasoning. Recall that, for Hobbes, geometry derives much of its philosophical value from the fact that it provides a convincing illustration of how the demonstrative method can compel (positive) belief in initially counterintuitive truths. Whereas we may be accustomed to thinking of the practical uses of mathematics primarily in terms of representational adequacy—e.g., its enabling role in allowing us to construct quantitative models of the world around us—Hobbes is interested in its instrumental effectiveness as a way of commanding assent and enforcing agreement. The rejection of the representational ideal has been noted previously:

93 Hobbes, *Leviathan* 1.11.

94 Finn, *Thomas Hobbes and the Politics of Natural Philosophy* 145.

Hobbes' new science of politics takes geometry as its model, not out of a Cartesian conviction that mathematics mirrors the underlying structure of the natural world, but because it does *not*. The civil philosopher's knowledge of matters political is every bit as certain as the geometer's, and for precisely the same reason: geometry is, in Hobbes' view, the product—indeed, the very paradigm—of human art and artifice.<sup>95</sup>

Not only is geometry a privileged domain of knowledge insofar as it admits of certainty, but its demonstrative methods are also tools for enforcing agreement, aiming at an *alignment of epistemic outlooks* which is incompatible with persistent dissent. Yet does this not mean that, in choosing the path of controversy, Hobbes is guilty of a performative self-contradiction of sorts? And, indeed, this is where a less charitable view needs to be adopted. After all, Hobbes insisted on his mathematical opinions even in the face of what many would regard as recognisably superior arguments to the contrary. In doing so, and in conflating his own grasp of geometrical knowledge with his insight into the centrality of the geometrical method in establishing secure knowledge, Hobbes came dangerously close to instantiating the very condition he deplored as 'intolerable in the society of men', namely 'when men that think themselves wiser than all others, clamor and demand right Reason for judge; yet seek no more, but that things should be determined, by no other mens reason but their own.'<sup>96</sup>

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95 Ball, "Hobbes' Linguistic Turn" 751.

96 Hobbes, *Leviathan* 1.5.



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*The Methods and Epistemic Virtues of a  
'Science of Man'*





# Analytic and Synthetic Method in the Human Sciences: A Hope that Failed<sup>1</sup>

*Thomas Sturm*

## Summary

During the eighteenth century, analytic and synthetic methods—developed in ways that were influential in the natural sciences by Galileo, Descartes, Newton, and others—were transferred into disciplines concerned with the human subject. Among the most important proponents of this were David Hartley, Étienne Bonnot de Condillac, and Charles Bonnet. However, critics—such as Thomas Reid and Christian Gottfried Schütz—raised objections to these methodological doctrines. By the end of the eighteenth century, appeals to this dual methodology—and reflections concerning its potential and limits—which had previously been more frequent, began to disappear from psychology and neurophysiology. I analyze the different versions of the methods as applied to the human sciences, as well as the main arguments brought to bear against them. In conclusion, I present some plausible explanations of why the methodological programme did not achieve greater success. This contributes new aspects to the history of Newtonianism in these fields, and highlights both how multifaceted and how problematic the movement was.

## Introduction

No natural scientist had a greater impact on the human sciences of the eighteenth century than Newton. His influence was far from uniform, however, and was related to different aspects of his empirical, theoretical, and

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<sup>1</sup> This essay amplifies, and develops further, material taken from Sturm T., *Kant und die Wissenschaften vom Menschen* (Paderborn: 2009) Ch. I §3 and Ch. II §§16–19. Many thanks to Eric Schliesser, Tamás Demeter, and three anonymous reviewers for valuable criticisms, and to Cynthia Kloor, Christopher Evans, and John Carson for linguistic assistance. Completion of this essay was supported by the Spanish Ministry for Science and Innovation, through research award FFI 2008-01559/FISO, and by the Catalan Institute for Research and Advanced Studies (ICREA).

methodological claims. David Hume and Adam Smith used the theory of universal gravitation as a metaphor or analogy for their views regarding the association of ideas, the force of sympathy in human interaction, and the laws of economics. David Hartley developed physiological underpinnings for a psychology of associations; a doctrine of nervous vibrations that he viewed as a continuation of speculations drawn from Newton's *Principia* of 1687 and *Opticks* of 1704. George Turnbull and, much more famously, Hume viewed the idea of introducing 'the experimental method of reasoning' into moral philosophy or the project of a 'science of human nature' as Newtonian in spirit. Hume, Smith, and also Thomas Reid, invoked Newton's famous 'Rules of Reasoning in Philosophy' from the *Principia*.<sup>2</sup> These influences are well known, have been studied in detail, and have also—as is usual with historical accounts—been disputed.<sup>3</sup>

- 2 E.g. Turnbull George, *De scientiae naturalis cum philosophia morali conjunctione* (Aberdeen, James Nicol: 1723); Turnbull George, *De pulcherrima mundi cum materialis tum rationalis constitutione* (Aberdeen, James Nicol: 1726); Turnbull George, *The Principles of Moral Philosophy*, 2 vols. (London: 1740) I, i–v and 1–24; Hume David, *A Treatise of Human Nature*, ed. L.A. Selby-Bigge (Oxford: 1978 [1739–1740]) xvif.; Hume David, *Enquiries Concerning Human Understanding and Concerning the Principles of Morals*, ed. L.A. Selby-Bigge; 3rd ed. P. H. Nidditch (Oxford: 1975 [1748–1751]) 14f.; Hartley David, *Observations on Man, his Frame, his Duty and his Expectations* (London: 1749) I, 6; Reid Thomas, *An Inquiry into the Human Mind* (Edinburgh: 1764) 97; Reid Thomas, *Essays on the Intellectual Powers of Man* (Edinburgh: 1785) 217; Smith Adam, "The History of Astronomy", in Wightman, W.P.D. – Bryce, J.C. (eds.), *The Glasgow Edition of the Works and Correspondence of Adam Smith*, vol. III: *Essays on Philosophical Subjects* (Indianapolis: 1980) 105; and Smith Adam, *The Glasgow Edition of the Works and Correspondence of Adam Smith*, vol. IV: *Lectures on Rhetoric and Belles Lettres*, ed. J.C. Bryce (Indianapolis: 1985) 143.
- 3 On aspects of Hume's Newtonianism see Stroud B., *Hume* (London: 1977) Ch. 1; Force J., "Hume's Interest in Newton and Science", *Hume Studies* 13 (1987) 166–217; Schliesser E., "Hume's Newtonianism and Anti-Newtonianism", *Stanford Encyclopedia of Philosophy* (2007); on Reid see Laudan L., "Thomas Reid and the Newtonian Turn of British Methodological Thought", in Butts R.E. – Davis J.W. (eds.), *The Methodological Heritage of Newton* (Oxford: 1970) 103–131; on Hartley see Smith C.U.M., "David Hartley's Newtonian Neuropsychology", *Journal of the History of the Behavioral Sciences* 23 (1987) 123–136, and Allen R.C., *David Hartley on Human Nature* (New York: 1999) 246–253; on Smith see Hetherington N., "Isaac Newton's Influence on Adam Smith's Laws in Economics", *Journal of the History of Ideas* 44 (1983) 497–505; Montes L., "Newton's Real Influence on Adam Smith and Its Context", *Cambridge Journal of Economics* 32 (2008) 555–576, and Schliesser E., "Some Principles of Adam Smith's Newtonian Methods in the Wealth of Nations", *Research in the History of Economic Thought and Methodology*, 23 (2005) 35–77. The list could be extended. One recent critic (Wood P., "Science, Philosophy, and the Mind", in Porter R. (ed.), *The Cambridge History of Science* (Cambridge: 2003) vol. IV,

A different aspect of Newton's influence that has not undergone as much scrutiny is his conception of the so-called 'analytic' and 'synthetic' methods, as presented in *Opticks* from the second edition of 1718. This is surprising, given the weight Newton confers upon that pair of methods. What is more, he claims that they are also fruitful for moral philosophy: 'And if natural Philosophy, in all its Parts, by pursuing this Method, shall at length be perfected, the Bounds of Moral Philosophy will also be enlarged.'<sup>4</sup> Newton did not intend to advance 'moral philosophy' as a purely descriptive and explanatory enterprise. He had a religious and ethical conception of it, confident that the right method would lead to knowledge of the fundamental and general causes of all phenomena—making God's power and our duties known to us.<sup>5</sup> Many authors followed Newton down this path, while others turned his ideas into tools for more secular conceptions of the human sciences. More importantly, in the course of the eighteenth century, his views on the two methods were to take on a life of their own: how to understand and use them came to differ from author to author. Be that as it may, invocations of the methods were connected to the hope that whoever discovered the right route for these sciences might be celebrated as a scientific mind similar to Copernicus, Kepler, Galileo, Boyle, Bernoulli, or—of course—Newton himself. This is not only true for British writers such as those mentioned; continental authors such as Étienne Bonnot de Condillac or Charles Bonnet also followed Newton's lead here.

Why, then, is there so little research into the impact of analytic and synthetic methods in the human sciences? I suspect that it is because the methods did not deliver on their promise and became less relevant after the eighteenth century. Becoming neglected over the course of history may lead to being neglected by historians as well; but even if one thinks that the methodological

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800–824) has argued that Newton was not the only influence; I do not doubt that to be true. Schliesser (e.g. Schliesser, "Hume's Newtonianism", and Schliesser E., "Newton's Challenge to Philosophy", *HOPOS: The Journal of the International Society for the History of Philosophy of Science*, 1 (2011) 101–128) argues that several of the authors mentioned here also distanced themselves from Newton. I do not engage in these disputes here.

4 Newton Isaac, *Opticks* (New York: 1952 [1730]) 405.

5 The passage continues: '[...] to know what is the first Cause, what Power he has over us, and what Benefits we receive from him, so far our Duty towards him, as well as that towards another, will appear to us by the light of Nature. And no doubt, if the Worship of false Gods had not blinded the Heathen, their moral Philosophy would have gone farther than to the four Cardinal Virtues; and instead of teaching the Transmigration of Souls, and to worship the Sun and Moon, and Dead Heroes, they would have taught us to worship our true Author and benefactor [...].—Newton, *Opticks* 405f.

programme received no more and no less than it deserved, there are still interesting questions here for the historian of science and philosophy. What versions of the methods were proposed, and how were they applied in the human sciences? What arguments were put forward regarding their limits? Why did they fail to deliver? To address these questions, I first outline Newton's pair of methods (section 1). I then explain how they were introduced into the human sciences by authors such as Hartley and Condillac, and—in what was perhaps their most refined version—by Bonnet, pointing also to their contemporary critics (section 2). In particular, I analyze a detailed and complex criticism of the use of these methods by a philosopher who is largely unknown these days, Christian Gottfried Schütz, thereby illustrating the limits of the methods, especially (though not only) in Bonnet's version of them (section 3).

### Newton on Analytic and Synthetic Methods

In his invocation of analysis and synthesis in *Opticks*, Newton implicitly referred to a certain historical tradition. The general idea has its roots in ancient geometry (especially Pappus and Diophantus). Via the School of Padua, it became important for Galileo; Descartes and Hobbes carried it over into philosophy; and Newton made it influential for the empirical natural sciences.<sup>6</sup>

According to the concept of analytic method widespread in geometry, the starting point of an investigation is either a given geometric theorem (such as the Pythagorean theorem) for which one tries to find a proof, or an equation with an unknown quantity for which one has to find a solution. The task is then to find true premises on the basis of which the theorem can be justified,

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6 See Descartes René, *Ouvres de Descartes*, ed. C. Adam – P. Tannery (Paris: 1964ff. [1897–1913]) VI, 76; *ibid.* VII, 155f. and X, 373f. and 406; Newton, *Opticks* 404–406. For additional ancient and early modern sources cf. Gethmann C.F., “Methode, analytische/synthetische”, in Ritter J. – Gründer K. (eds.), *Historisches Wörterbuch der Philosophie* (Darmstadt: 1980) vol. v, 1332–1336. For closer studies of the historical variations of the distinction between analytic and synthetic methods cf. Hintikka J. – Remes U., *The Method of Analysis* (Dordrecht: 1974); Hintikka J., “A Discourse on Descartes's Method”, in Hooker M. (ed.), *Descartes: Critical and Interpretive Essays* (Baltimore: 1978) 74–88; Koertge N., “Analysis as a Method of Discovery during the Scientific Revolution”, in Nickles T. (ed.), *Scientific Discovery, Logic, and Rationality* (Dordrecht: 1980) 139–157; Marchi P., “The Method of Analysis in Mathematics”, in Nickles T. (ed.), *Scientific Discovery, Logic, and Rationality* (Dordrecht: 1980) 159–172; Jahnke H. (ed.), *Geschichte der Analysis* (Dordrecht: 1999); Otte O. – Panza M. (eds.), *Analysis and Synthesis in Mathematics: History and Philosophy* (Dordrecht: 1997); Guicciardini N., *Isaac Newton on Mathematical Certainty and Method* (Cambridge, MA: 2009).



or the equation be solved. Thus, with this method one does not start from a body of geometric axioms and postulates and then derive the theorem (or the solution) from them (that would mean using the synthetic method, for which Euclid's *Elements* with its deductive structure was the most influential model). Perhaps such a body of axioms is not even known yet. Descartes, as well as Arnauld and Nicole in their influential *Logique*,<sup>7</sup> accordingly described the analytic method also as a tool for the discovery of genuinely *new* knowledge. It was also often assumed that the Greeks had understood the method much better, and that much of their knowledge of the method had been lost.

Now, according to Newton both the 'method of analysis' and the 'method of composition' should be applied not only in mathematics, but also in the empirical natural sciences. As will become clear, that considerably alters the character of the methods.<sup>8</sup> First though, what is Newton's conception? The central passage from *Opticks* reads as follows:

As in Mathematicks, so in Natural Philosophy, the Investigation of difficult Things by the Method of Analysis, ought ever to precede the Method of Composition. This Analysis consists in making Experiments and Observations, and in drawing general Conclusions from them by Induction, and admitting of no Objections against the Conclusions, but such as are taken from Experiments, or certain other Truths. For Hypotheses are not to be regarded in experimental Philosophy. And although the arguing from Experiments and Observations by Induction be no Demonstration of general Conclusions; yet it is the best way of arguing which the Nature of Things admits of, and may be looked upon as so much the stronger, by how much the Induction is more general. [...] By this way of Analysis we may proceed from Compounds to Ingredients, and from Motions to the Forces producing them; and in general, from Effects to their Causes; and from particular Causes to more general ones, till the Argument end in the most general. This is the Method of Analysis: And the Synthesis consists in assuming the Causes discover'd, and establish'd as Principles, and by them explaining the Phenomena proceeding from them, and proving the Explanations.<sup>9</sup>

7 Descartes, *Oeuvres de Descartes* VI, 76 and X, 373; Arnauld Antoine – Nicole Pierre, *La logique, ou l'art de penser* (Amsterdam: 1662) ch. IV ii. These views did not go without criticism; see footnote 16 below.

8 Koertge, "Analysis as a Method of Discovery" 148.

9 Newton, *Opticks* 404f.

While the *Opticks* was first published in 1704, this passage was not included until the second edition of 1718. However, it was mostly written in 1686–1687, perhaps to be inserted into the *Principia*, although it does not appear there either.<sup>10</sup> So Newton did not come to the claim of the importance of the analytic and synthetic methods only in *Opticks*; but neither was he ready to go public with them in 1704. This may be because during those years his opinions changed about whether his new infinitesimal calculus—the ‘method of fluxions’—should be considered an analytic or a synthetic method.<sup>11</sup> Newton’s transfer of the analytic and synthetic methods from mathematics to natural science must in part be understood as the fruit of reflection on analysis and algebra and how to apply them to phenomena of motion; the calculation of curves, surfaces, volumes, and the rates of change of velocities; and other issues. However, we need not dwell on these reflections, in which he also discusses Pappus’s and Descartes’s opinions. Newton’s treatises on the subject were published posthumously,<sup>12</sup> and I know of no evidence that they had any methodological influence on psychology or related disciplines.

Moreover, the passage cited above is *not* concerned with the question of what kind of mathematical tools to apply in empirical science, and whether then to understand that mathematics as proceeding analytically or synthetically. Rather, Newton embedded the pair of methods in a program for grounding *causal explanation* in nature, whether or not this programme was aided by mathematics or not. He was not the first to give the pair of methods this meaning. Hobbes, for instance, had said similar things.<sup>13</sup> However, probably because Newton’s abstract understanding of the method was accompanied by successful and widely accepted examples—his optical doctrines about light and colour—his views became, as we will see, influential in the human sciences.

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10 Koertge, “Analysis as a Method of Discovery” 149.

11 Guicciardini N., “Analysis and Synthesis in Newton’s Mathematical Work”, in Cohen I.B. – Smith G.E. (eds.), *The Cambridge Companion to Newton* (Cambridge: 2002) 319–323. For a detailed study of the development of Newton’s methodology in relation to the calculus, see Guicciardini, *Isaac Newton on Mathematical Certainty and Method*.

12 Newton Isaac, “Analysis and Synthesis: Newton’s Declaration on the Manner of Their Application in the ‘Principia’”, in Whiteside D.T. (ed.), *The Mathematical Papers of Isaac Newton* (Cambridge: 1981) vol. III, 442–459; see Guicciardini, “Analysis and Synthesis in Newton’s Mathematical Work”.

13 Talaska R.A., “Analytic and Synthetic Method according to Hobbes”, *Journal of the History of Philosophy* 26 (1988) 207–237.

In Newton's view, experiments and observations, or the 'particular propositions' gained through them,<sup>14</sup> are where to start. These, it is assumed, are then generalized by 'induction', and the result should be causal explanations of the phenomena that one started with, and others as well. The kind of 'induction' meant here is thus one of inferring causes of empirically given phenomena from those phenomena themselves. Moreover, it should be possible to achieve not only particular causal explanations, but ultimately the most general ones. The synthetic method proceeds almost inversely: explanations for phenomena have to be presented by the synthetic method in a proof-like manner. The discovered causes—or suitable causal laws—are to be taken as principles of explanation. Phenomena are to be deduced from them and, moreover, even the explanations themselves proved in some way by this method. The two methods of analysis and synthesis are thus complementary.

To elucidate these ideas further, it is essential to clarify three aspects of Newton's views. The first point is that—in contrast to the conception of analysis and synthesis in geometry—what is sought here are no longer *proofs* for given theorems, but *explanations* for specific phenomena.<sup>15</sup> In the analytic method, phenomena serve to find causes; in the synthetic method, in contrast, phenomena are to be explained by the analytically disclosed causes. It is perhaps tempting to consider the analytic method a procedure for *discovering* or devising causal explanations, and the synthetic method a procedure for *justifying* these explanations.<sup>16</sup> However, on the one hand Newton explicitly claims

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14 Newton Isaac, *Mathematical Principles of Natural Philosophy*, ed. and trans. A. Motte (London: 1726) 443.

15 Descartes, *Oeuvres de Descartes* VI, 76, sees things similarly with respect to the analytic method: observed facts should not, via hypotheses discovered through the analytic method, be proven, but explained. Otherwise the objection that the analytic method leads to circularity would be legitimate: certain causes would be tapped from experiences, as effects, and formulated as law-like hypotheses; from these hypotheses one would, in turn, deduce the experiences. Descartes is right to point out the threat of circularity, although some interpreters believe it is not as clear as he assumes. Cf. Buchdahl G., *Metaphysics and the Philosophy of Science* (Oxford: 1969) 144–147.

16 See Hankins T.L., *Science and the Enlightenment* (Cambridge: 1985) 20. Expressed in early modern terms, the question is whether the analytic method is to be taken as an *ars inveniendi*, or also as an *ars judicandi*. In a polemic against Aristotelian, scholastic syllogistics, Descartes complains that syllogistics is not a method for finding (*inventio*) new knowledge—something that is actually needed in philosophy (Descartes, *Oeuvres de Descartes* x, 406). One could use analysis for this, however, as it is a method that even '[...] ancient geometricians [...] extended to the solution of all problems [...] (ibidem x, 373).

to be able to *infer* or ‘establish’ causes from observations and their analysis, thus also in some sense vindicating his causal claims. In this vein, on the organization of *Opticks* he writes: ‘In the two first Books of these Opticks, I proceeded by this Analysis to *discover and prove* the original Differences of the Rays of Light in respect of Refrangibility, Reflexibility, and Colour [...]’.<sup>17</sup> On the other hand, initially the synthetic method is a procedure for the proof-like *representation* of causal explanations, not a proof itself. In Newton’s opinion, the validity of a proof of a causal claim lies in certain auxiliary assumptions: among others in the correct analysis of the phenomena and the generality of the induction in the theoretical explanation—in phenomena being described correctly and all relevant phenomena being traced back to their causes. That is why the analytic method ought to precede the synthetic.

This brings us to the second point. What is meant by ‘analysis’? If it is not clear just what such analysis consists of, or how to perform it, the enterprise of legitimate causal explanation is stuck right from the start. Newton comes from the apposite assumption that one cannot simply infer causes from the observation of effects—or general explanatory principles from specific individual observational statements. The reason is partly that we cannot deductively infer general statements from particular statements: that ‘the arguing from Experiments and Observations by Induction [is] no Demonstration of general Conclusions’.<sup>18</sup> However, he also explains<sup>19</sup> that generalization by induction ‘is the best way of arguing which the Nature of Things admits of, and may be looked upon as so much stronger, by how much the Induction is more general’. But to achieve its end, the method of induction requires at the very least that a *certain* analysis of the observations or experiments be done. It requires appropriate distinctions regarding individual aspects of the complex phenomenon

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Arnauld and Nicole (*La logique* ch. iv.ii) similarly called the analytic method a ‘méthode d’invention’, and the synthetic method ‘méthode de doctrine’. See, for instance, Ferguson Adam, *Institutes of Moral Philosophy* (Edinburgh: 1769) 3f. Others disagreed inasmuch as not only the analytic, but the synthetic method too can be a procedure for discovering or gaining new insights (especially Leibniz Gottfried Wilhelm, *Die philosophischen Schriften*, ed. C.I. Gerhardt (Hildesheim: 1965) VII, 292–298).

17 Newton, *Opticks* 405; italics added.

18 As is well-known, Popper K.R., *Logic of Scientific Discovery* (London: 1959) addressed the logical asymmetry of particular and general statements in his critique of the inductive method. As the preceding citation shows, Newton (*Opticks* 404f.) was fully aware of this point, and he also indicates that the possibility of empirical falsification plays a central criterial role. See also Smith G.E., “The Methodology of the Principia”, in Cohen I.B. – Smith G.E. (eds.), *The Cambridge Companion to Newton* (Cambridge: 2002) 160f.

19 Newton, *Opticks* 404.

or process—distinctions that in turn are suitable for explanations of phases in the course of events or explanations of relationships that hold between a composite and its parts. In a given case, one proceeds from ‘Compounds to Ingredients’ or from ‘Motions to Forces producing them’. Newton calls both of these kinds of analysis.

One example—of proceeding from ‘Compounds to Ingredients’—is analysis based on optical experiments with prisms and lenses.<sup>20</sup> It is based on the phenomenon known well to Newton’s contemporaries that when light passes through lenses or prisms, it can decompose into visible colours. Using appropriate equipment, Newton amplifies the effect: white light appears to be a compound of light of different colours. By letting the variously coloured light rays pass through a second prism situated behind the first, it can be shown that the individual spectral colours themselves are not compounds. It is also possible to recompose white light by redirecting the spectral colours back through a converging lens.<sup>21</sup> Inasmuch as the experimental instances of this phenomenon can be considered typical, or as rooted in natural kinds and their properties and relations, one may conclude that the explanatory relationship between parts and compounds (or between motions and forces producing them) also holds for further instances.<sup>22</sup> In this way, generalization by induction is considered possible. Last, but not least, the fact that phenomena can be manipulated in experiments made this procedure plausible.

The third point concerns Newton’s talk of ‘induction’ within the context of analysis and synthesis. Of course, the way of drawing causal conclusions just described is common practice in both everyday life and in science: physicians diagnose illnesses from symptoms, mechanics can conclude what is broken from the sounds an engine makes, historians arrive at conclusions about historical events and their causal relations by examining source texts, and experimenters extract theoretical explanations from data. Explanatory objectives guide the inferences we make from given data to causal explanations for that data.<sup>23</sup> But we have to add here once again that for Newton the methods of analysis and synthesis are complementary and, moreover, that for him (unlike

20 Ibidem 64ff.

21 The history of Newton’s experiments with light and the consequent debate is naturally more complicated. See Schneider I., *Isaac Newton* (Munich: 1988) 87–107; Zemplén G., *The History of Vision, Color, and Light Theories* (Bern: 2005) 263–289.

22 Many further examples of this can be found. Descartes’s work on optics illustrates how the analytic method from geometry could be applied in empirical disciplines. Buchdahl, *Metaphysics and the Philosophy of Science* 118–147, provides an astute discussion of it.

23 Cf. Lipton P., *Inference to the Best Explanation* (London: 1991).

for Descartes, Arnauld, and Nicole, and others) the point of the synthetic method is not merely to achieve proof-like presentation. Rather, 'synthesis' also implies *connecting and ordering* causal explanations in order to construct a comprehensive and systematic theory of a given domain of phenomena. Explanations can be justified by synthesis inasmuch as they take all pertinent empirical phenomena into consideration and check that specific causal explanations fit into an overarching scheme of fundamental and general causal principles. Only this can ensure that alternative causal explanations have been excluded.<sup>24</sup> Viewed against this background, Newton's talk of induction is much more akin to Peirce's notion of abduction, or with what is now called 'inference to the best explanation', than to naïve inductive generalization from particular instances.<sup>25</sup>

It should be clear that many aspects of Newton's methodology represent both a widespread scientific practice and constitute topics of continuous philosophical interest. His views are not without serious difficulties; but it would take us too far off track to discuss this more generally at this point. It is more appropriate to turn to contemporary efforts to apply these methods to the human sciences, and then to the problems they faced.

### Analytic and Synthetic Methods in the Human Sciences: Hartley, Bonnet, and Condillac

Authors varied with respect to which parts and doctrines they adopted from Newton's methodology of analysis and synthesis. To take the most obvious choice, they could consider whether to use both methods, or only one—and if the latter, which of the two and for what reasons.

#### 1 *David Hartley: A Neuropsychology Based on the Analytic–Synthetic Method*

The *Observations on Man, his Frame, his Duty, and his Expectations* (1749) by the English physician David Hartley provide perhaps the most explicit example of enacting a Newtonian program in the human sciences, both in theory and

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24 Cf. also Newton's "Rules of Reasoning" (Newton, *Mathematical Principles* 320f.): the number of causes is to be kept as small as possible and the same causes are to be assigned to the same effects (Rules I and II); and alternative hypotheses are irrelevant, as long as the ones we have sufficiently explain the phenomena (Rule IV).

25 I agree here with George Smith, "The Methodology of the Principia" 161.

method. First, Hartley explicitly claimed to be arguing in favour of his account by means of Newton's methodology:

My chief design [...] is briefly to explain, establish, and apply the doctrines of *vibrations* and *associations*. [...] The proper method of philosophizing seems to be, to discover and establish the general laws of action, affecting the subject under consideration, from certain select, well-defined, and well-attested phenomena, and then to explain and predict the other phenomena by these laws. This is the method of analysis and synthesis recommended and followed by Sir Isaac Newton.<sup>26</sup>

The whole superstructure of ideas and associations observable in human life may, by proceeding upwards according to analysis, and downwards according to synthesis, be built upon as small a foundation as we please.<sup>27</sup>

Second, much of the content of Hartley's theory of the human mind was inspired by hints and hypotheses presented by Newton, especially in *Opticks*. Hartley viewed nerves as solid fibres composed of minute particles vibrating in the ether in response to how they are affected by external objects or events. Different sensations occur depending on how the vibrations of the nerves vary in frequency, intensity, kind, place, and direction. For instance, Hartley used Newton's views concerning the colour spectrum and the frequency ratios between primary colours.<sup>28</sup> Nerve vibrations also produced acts of judgement or will. Hartley introduced some even more demanding assumptions in order

26 Hartley David, *Observations on Man, his Frame, his Duty and his Expectations* (London: 1749) 4f.

27 Ibidem 45f.; cf. ibidem 91. Similarly, for example, Trembley Jean, "Réponse à la question, proposée par la Société de Haarlem: Quelle est l'Utilité de la Science Psychologique dans l'éducation & la direction de l'Homme, & relativement au bonheur des Sociétés? Et quelle serait la meilleure maniere de perfectionner cette belle Science, & d'accroître ses progrès?", *Verhandeligen, uitgegeeven door de Hollandsche Maatschappye der Weetenschappen, te Haarlem* (Haarlem: 1781) 245. Later on in the *Observations*, Hartley used the distinction between the methods to explain the difference between geometry (as proceeding synthetically) and algebra (as proceeding analytically), as if the methods were independent from one another (Hartley, *Observations* 176f.). However, this has to be seen against the background of his goal in that particular context, which was a general examination of the acquisition of language. For the historical background see Allen, *David Hartley on Human Nature* 228–230.

28 Hartley, *Observations* 121–124. He also had other sources, such as Boerhaave, Berkeley, and the astronomer Robert Smith; see e.g. ibidem 125, 128–130.



to account for learning complex kinds of voluntary action, and then to turn these into 'secondarily automatic' actions again. For instance, children not only learn to gain motor control over their hands, their speech apparatus and their bladders, thus turning reflexes into voluntary actions; they also learn to execute those actions automatically again.<sup>29</sup> His comprehensive scheme was meant to provide a thoroughly mechanistic explanation of human cognition, motivation, and action.<sup>30</sup>

Hartley meant that his principles of association are identified by some kind of analysis, and then subsequently used to explain synthetically all sorts of mental behaviour. Contemporaries interpreted him somewhat differently. Joseph Priestley—who otherwise praised Hartley's book in the highest terms as containing a 'new and most extensive science'<sup>31</sup>—thought that, because of its mode of representation in terms of quasi-axiomatically stated principles from which other claims are derived and corollaries added, the method by which Hartley developed his theory was 'strictly geometrical, and synthetical'.<sup>32</sup> Priestley also claimed<sup>33</sup> that Hume used only the analytic method (a questionable reading).<sup>34</sup> Priestley made his remarks in the context of explaining what an effective mode of speech or discourse was, and he claimed that one could choose quite freely between the methods, depending on one's specific aims; whether one wished to 'demonstrate a truth unknown to others' (by synthesis) or 'to set one that is known in the strongest light' (by analysis)—characterizations of the methods that differ strongly from the tradition as

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29 Ibidem 65–69.

30 Ibidem 6, 21, 31, 70.; cf. Newton, *Mathematical Principles* 443; Newton, *Opticks* 353f. It should be noted that neither Hartley nor Bonnet thought that such an account would prove physicalist monism or reductionism about the mind (see Sturm, *Kant und die Wissenschaften vom Menschen* 74). Quite the contrary, both viewed their neuropsychological studies as completely continuous with, and even supportive of, a Christian view of the soul.

31 Priestley Joseph, *An Examination of Dr. Reid's "Inquiry into the Human Mind on the Principles of Common Sense," Dr. Beattie's "Essay on the Nature and Immutability of Truth," and Dr. Oswald's "Appeal to Common Sense in Behalf of Religion"* (London: 1774) xix.

32 Priestley Joseph, *A Course of Lectures on Oratory and Criticism* (London: 1777) 62.

33 Ibidem 60f.

34 Hume formulated a view similar to Hartley's of how to develop general principles of the 'science of human nature' and then to apply these in the explanation of phenomena, but without speaking explicitly of the analytic and synthetic methods (Hume, *Enquiries* 84f.; cf. Hume, *Treatise* 403). This is striking, but I shall not speculate on his reasons for this here. A very interesting comparison between his views and the Newtonian methodology is presented in Demeter T., "Hume's Experimental Method", *British Journal for the History of Philosophy* 20 (2012) 577–599.



described above. Hartley, however, was committed to Newton's claim that the methods are related such that synthesis (at least concerning 'difficult Things')<sup>35</sup> is impossible without prior analysis. Given that he also claimed that an analysis could help to discover laws, Hartley would also have denied Priestley's idea that analysis was merely about representing more clearly what one already knows.

Unfortunately, when it comes to the physiological underpinnings of his mechanistic psychology, Hartley did not fulfil his cherished methodological requirements. To begin with, his theory started from a purely *psychological* principle of association:

Any sensations *A, B, C*, etc., by being associated with one another a sufficient number of times, get such a power over the corresponding ideas *a, b, c*, etc., that any one of the sensations *A*, when impressed alone, shall be able to excite in the mind *b, c*, etc., the ideas of the rest.<sup>36</sup>

Granting that this and other principles of association are true laws (which was soon disputed) and even granting for the moment Hartley's additional and more questionable claim that all ideas in the mind are made up of sensations, how do we get from here to the *neuropsychological* claim that such associations between sensations are realized by neural processes? And by which ones?

The Swiss naturalist and philosopher Charles Bonnet—about whom, more in the next section—objected to the details of neurophysiological theories like Hartley's, arguing that the nerves are not like the taut strings of an instrument, made to vibrate by external physical stimuli. In Bonnet's view, nerves are too soft for that.<sup>37</sup> Instead, we should think of nerves as tubes containing a fluid that carries the 'vital' or 'personal spirit', whose effects are similar to those of heat or electricity. This fluid is as fine and nimble as light, which explains how sense impressions are transmitted rapidly and the great differences in the effects of mental activities.<sup>38</sup> One could also imagine differences among the nerves and the processes taking place within them as explaining differences in sensations. Analogous to Newton's studies of the properties of light, for example, particular nerve fibres might be sensitive to different colours.

Another critic of Hartley's was Reid, who went further and launched a number of severe objections. To begin, he rejected a neurophysiological theory

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35 Newton, *Opticks* 404.

36 Hartley, *Observations* 41.

37 Bonnet Charles, *Essai analytique sur les facultés de l'âme* (Paris: 1760) 20.

38 Ibidem 21.

like Bonnet's on empirical grounds: 'neither eyesight nor the most delicately done injections has shown the nerves to have a tubular structure'. But Hartley's theory was no good either. Reid claimed that while Newton had clearly distinguished between 'doctrines that he claimed to prove by sound induction' and 'conjectures that were to stand or fall depending on whether future experiments and observations should establish or refute them', Hartley often mixed these two. For instance, in his argument for the theory of vibrations he assumed that we often observe that 'sensations of seeing and hearing, and some sensations of touch, last for a short time after the impression from the object has ceased'—a claim Reid found convincing (consider the perception of a continuous circle of light, produced by seeing a quickly moving piece of charcoal). But, as he continued, Hartley inferred from this that 'external objects cause vibrations in the substance of the nerves and brain; because vibration is the only kind of movement that can continue for any length of time after its cause has ceased.' Reid objected that other kinds of motion besides vibration can have some 'continuance, for example rotation, bending or unbending of a string [...]. And in any case we don't know that what is produced in the nerves in perception is motion; perhaps it is pressure, attraction, repulsion, or something we don't yet know'. Despite its apparently highly systematic structure, Hartley's theory could not be stronger than its weakest links, and the inference to the vibratory nature of nerves and their activity was quite unconvincing. Generally, Reid viewed physiological research into such matters as fundamentally fragmentary. He even considered unintelligible, that the mind, as unity of consciousness, thinking, and perception, might be based on physiological processes.<sup>39</sup>

To sum up: Hartley did not use a truly experimental analysis comparable to, say, Newton's analysis of the spectral colours of white light to support his spe-

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39 Reid, *Essays* ch. 11. iii–v.; cf. Allen, *David Hartley on Human Nature* 375–382. It might be said that Bonnet's theory of vital spirits could easily be confronted with Reid's criticism too: does it explain why neural processes are accompanied by, or appear to us as, mental processes? Because Bonnet was far from being a reductive physicalist as we know them today (see Section 2.2 below), one might think his views were not threatened by such a criticism. However, that is not quite correct. Some current antireductionists do not use their arguments to prove that the mind is not physical. Rather, they point to what has become called the 'explanatory gap'. (Levine J., "Materialism and Qualia: The Explanatory Gap", *Pacific Philosophical Quarterly* 54 (1983) 354–361.) I am not particularly convinced of such arguments (see Sturm T., "Consciousness Regained? For and Against Reductive Physicalism about Qualia", *Dialogues in Clinical Neuroscience* 52 (2012) 55–63), but it is true that they have to be dealt with carefully.

cific neurophysiological account of mental associations. As he himself admitted, his account remained mostly speculative.<sup>40</sup> As just shown, critics did not refrain from rubbing further salt into the wound.

## 2 *Bonnet and Condillac: Psychology Only Uses the Analytic Method*

As already indicated, Bonnet also hoped to provide neurophysiological explanations of mental phenomena. One specific reason for this probably has to do with his discovery of a disease that he was the first to describe—in reference to the case of his grandfather, Charles Lulin, and which became known as Charles Bonnet syndrome:<sup>41</sup> given a certain deterioration of the visual system, one experiences severe visual hallucinations even when otherwise healthy and normal. When activated inappropriately, nerve fibres might lead to inappropriate perceptual experiences, such as the appearance of lines, dots, or geometrical patterns; or even—as in Bonnet's grandfather's case—of people, birds, houses, and coaches. Such hallucinations are not an indication of madness but—from today's point of view—the response of a brain that is not receiving sufficient visual information from the environment.<sup>42</sup> In other words, nerve fibres themselves can somehow spontaneously bring about mental phenomena.

Although observations like these might be seen as circumstantial evidence for a neuropsychological approach, more detailed explications and justifications were needed, if only in order to avoid problems such as those encountered by Hartley's views. Bonnet tried to provide these. He was among the first authors to develop the idea that psychology should become a scientific discipline in its own right.<sup>43</sup> Moreover, he thought that to promote this, psychology could (and should) use only the analytic method, leaving aside the synthetic

40 Cf. Smith, "David Hartley's Newtonian Neuropsychology" 133.

41 Bonnet, *Essai analytique* 426–428.

42 Ffytche D.H., "The Visual Unconscious: Perspectives from the Charles Bonnet Syndrome", in Perry E. – Collerton D. – LeBeau F. – Ashton H. (eds.), *New Horizons in the Neuroscience of Consciousness* (Amsterdam: 2010) 215–226.

43 See Bonnet, Charles, *Essai de psychologie ou considerations sur les operations de l'âme, sur l'habitude & sur l'éducation* (London: 1755); Bonnet, *Essai analytique*. He was perhaps influenced by Christian Wolff in Germany. Wolff had started an influential school in the 1730s, leading even to dissertations on psychological topics using quantitative and experimental tools (see Sturm, *Kant und die Wissenschaften vom Menschen* ch. II). I mostly ignore this tradition here, since in the Wolffian school the conception of psychology was not explicated by reference to the analytic–synthetic method as understood by Newton. Bonnet influenced others in Germany and elsewhere to develop psychology, leading sometimes to extensive, 300-page essays (Trembley, "Réponse à la question").

method—hence the title of his *Essai analytique sur les facultés de l'ame* (1760). Thus, his views constitute another detailed attempt to refine the metaphysics and methodology of a Newtonian approach within psychology (peppered with Lockean influences among others), if not the human sciences more generally.

To begin this task, Bonnet<sup>44</sup> characterized the analytic method as a kind of 'dissection'. As he remarked, mental phenomena such as perception are highly complex. He therefore asked that we analyze or 'dissect' such phenomena as carefully as possible. In this, like Newton, he pursued the goal of causal explanation:

Like physics, psychology consists of two main parts, one subordinate to the other: the *historical* & the *systematical*. The first contains the presentation of facts; the second their explanation. [...] But to arrive at principles that could extend a little our knowledge of the operations of our soul, I know of only one method, & that method is *analysis*. [...] One must dissect every fact, decompose it into its smallest parts, & examine each of the parts separately. One must search for the relations which connect these parts among themselves & to analogous things, & find the results which can lead to principles. In a word, one has to analyze everything [...].<sup>45</sup>

As Bonnet put it, he was looking for the 'mechanism of our faculties'.<sup>46</sup> The adequacy of causal explanation depends on the adequacy of observation and its analysis; but how does one arrive at causally explanatory principles by 'dissecting' a complex phenomenon? Bonnet maintains that it is possible by including another assumption: causal or mechanical explanations of mental states are explanations that make use of mental *faculties* or powers. We recognize those faculties only by observing and analyzing their effects—the mental acts themselves (as manifested by certain bodily states): 'We know the soul

44 Bonnet, *Essai analytique* iii–vii.

45 'La Psychologie a, comme la Physique, deux Parties principales, subordonnées l'une à l'autre; la Partie *Historique* & la Partie *Systématique*. La première renferme l'exposition des Faits; la seconde leur explication. [...] Mais pour arriver à des Principes qui puissent étendre un peu nos Connoissances sur les Opérations de nôtre Ame, je ne connois qu'une Méthode, & cette Méthode est *l'Analyse*. [...] Il faut anatomiser chaque Fait, le décomposer jusques dans ses plus petites parties, & examiner séparément toutes ces Parties. Il faut chercher les Rapports qui lient ces choses entr'elles & aux choses analogues, & trouver des Résultats qui puissent devenir des Principes. En un mot; il faut ici analyser tout [...]'—*ibidem* ii–iii.

46 *Ibidem* ii and vi.

only through the faculties; we know the faculties only from their effects'.<sup>47</sup> Now, analysis should lead us not simply to mental faculties, but eventually also to knowledge of *fundamental* faculties. We should be able to recognize the parts of a psychological phenomenon and their relationships within the whole; and inasmuch as one believes it is possible to explain psychological phenomena by tracing them back to certain mental capabilities, one should identify the basic elements and trace them back to the corresponding fundamental faculties.

But how exactly would that kind of analysis, which could lead to the discovery of basic faculties, work? Bonnet used a thought experiment that Étienne Bonnot de Condillac had already used in *Traité des sensations* (1754). Imagine a statue whose senses come alive one after another until it becomes a 'thinking being'.<sup>48</sup> Condillac wanted to show, in contrast to Locke, that sensation by itself is sufficient to trigger higher mental activities such as remembering, thinking, judging, or desiring; and that these mental acts therefore require no independent skill of reflection. He began with olfaction. This, he thought, is the sense with the least informational value; or certainly with less than sight or the sense of touch. Nonetheless, even the sense of smell is sufficient to evoke all the mental activities that otherwise are seen as based on reflection. Consider, for instance, what becomes possible by sensing the fragrance of a rose: attention, pleasure and pain; even memory, judgement, etc., are all simply different kinds of sensation. The reoccurrence of individual sensations allows the statue to remember or to associate ideas. One after another, Condillac introduced other senses in order to examine which concepts are 'awakened' by them individually, in combination with other senses, conjoined for example with the sense of hearing, smell, or sight, the kinds of memory involved, and so on. In deliberations such as these, Condillac considered various functions of the senses and other mental capacities. He viewed some relationships of capacities as symmetrical, others as asymmetrical: some capabilities were seen as basal, others were complex, composed of simple capabilities, or considered causally independent. The procedure was not exhausted by describing and analyzing mental capacities, but was used to pursue explanatory objectives. Bonnet questioned many of Condillac's specific claims, but insisted that he was employing the same method.

Many empirical psychologies of the time, such as those developed by Christian Wolff and his followers, also attempted to devise a theory of mental faculties in order to explain mental states. The description of the analytic

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47 'Nous ne connoissons l'Ame que par les Facultés; nous ne connoissons ces Facultés que par leurs Effets'—Bonnet, *Essai de psychologie* 1.

48 Bonnet, *Essai analytique* 8.

method alone, however, does not indicate that one should or could look for *physiological* explanations of mental phenomena. One could, in principle, remain entirely at the psychological level, as documented by Condillac's analyses of the functional relationships of various mental capacities.<sup>49</sup> Claiming more than that could easily lead to objections such as those encountered in the discussion of Hartley's views. However, although Bonnet called his research 'psychology', he did not stop at psychological contemplation:

The soul acts upon the body, & through the body. Therefore, one must always come back to the physical, as the origin of all that the soul experiences. We know no more what an idea in the soul is, than we know what the soul itself is; but we know that ideas are connected to the action of certain fibres: because we can observe the fibres, we can thus reason about the fibres. We can study to a degree their motions, the consequences of their motions, & the connections among the fibres.<sup>50</sup>

Just how did Bonnet want us to take his claim to physiological explanation? When he said that the 'soul works through its body', he meant that the body—especially the nervous system—is a condition for mental activity in the sense that *de facto* we perform our mental acts via it. The brain, or a part of it, is the 'immediate instrument' of emotion, thought, and action,<sup>51</sup> working roughly as outlined in his criticism of Hartley's view. However, the theses about the precise structure and operations of the brain must be dealt with judiciously, as Bonnet himself emphasized.<sup>52</sup> First, they cannot directly result from analyzing mental phenomena. They require physiology to be studied more deeply and the relations between observed physiological phenomena and the assumptions made for psychology to be explored. This would, most likely, have to include detailed

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49 See also Tetens Johann Nicolas, *Philosophische Versuche über die menschliche Natur und ihre Entwicklung*, 2 vols. (Leipzig: 1777).

50 'C'est sur son Corps, & par son Corps que l'Ame agit. Il faut donc toujours en revenir au Physique, comme à la première origine de tout ce que l'Ame éprouve. Nous ne savons pas plus ce qu'est une Idée dans l'Ame, que nous ne savons ce qu'est l'Ame elle-même; mais, nous savons que les Idées sont attachées au Jeu de certaines Fibres: nous pouvons donc raisonner sur ses Fibres; par ce que nous voyons des Fibres. Nous pouvons étudier un peu leurs mouvemens, les Résultats de leurs mouvemens, & les Liaisons qu'elles ont entr'elles'—Bonnet, *Essai analytique* xiii.

51 Ibidem 19.

52 Ibidem 23.

and systematic studies of lesions of the brain and other parts of the cognitive system, such as the correlation between deterioration of the visual apparatus and the occurrence of hallucinations described as Charles Bonnet syndrome. Second, Bonnet did not advocate strong psychophysical reductionism or an identity theory of the mind–brain relation. He considered the brain merely an ‘instrument’ for mental activity, and this means that—at least in principle—other tools are conceivable. He also suggested that it is not absolutely crucial to know which nerve fibres are responsible for which activities or traits—even if it were true that one (basal) type of nerve activity is responsible for each (basal) type of mental activity. For these reasons and because of his claim that we know ‘the soul only through its faculties; and these faculties we know only by their effects’, Bonnet might best be viewed as an early advocate of what philosophers of mind today call *functionalism*. According to that view, mental properties are characterized by their typical causes and effects, independently of whether those typical causes and effects can be identified with physical properties.<sup>53</sup>

For all the critique of this conception that I turn to in the next section, it is worthy of note that his approach remained consistently empirical in one respect. Bonnet remarked<sup>54</sup> that his study involves ‘much physics, and little metaphysics’. Not only did he view knowledge of relations between mental states and nerve fibres as independent of any strong metaphysical assumption about the relation between mind and body; he also took it to be independent of the question of how an idea can be ‘in the soul’ or what a ‘soul itself’ actually is. Bonnet shared the opinion, traced back to Locke, that it is impossible to know the real essence of substances.<sup>55</sup> Thus, on this view, what we have with regards to the mind and its relationship to the body is purely empirical knowledge.<sup>56</sup>

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53 Functionalists’ opinions differ on this (see Churchland, P., *Matter and Consciousness* (Cambridge, MA: 1988) 36–42; Beckermann, A., *Analytische Einführung in die Philosophie des Geistes* (Berlin: 2001) 141–180). It is another question whether the identity of mind and brain must—as functionalists assume—be only contingent and not necessarily true; Bonnet implicitly makes this assumption. For our purposes we need not enter that debate.

54 Bonnet, *Essai analytique* xiii.

55 Ibidem xiv and xx.

56 Ibidem xvii.



### Schütz's Three Objections to the Analytic Method

Christian Gottfried Schütz (1747–1832), a philosopher and literary scholar who is mostly unknown nowadays, was a correspondent of Immanuel Kant, and one of the first propagators of the latter's critical philosophy.<sup>57</sup> In 1771 Schütz published his translation of Bonnet's *Essai analytique*, adding to it an extensive essay dealing with "Considerations on the Different Methods of Psychology" (*Betrachtungen über die verschiedenen Methoden der Psychologie*). In that somewhat remarkable essay, he discussed various methods of psychology in detail,<sup>58</sup> including Bonnet's and Condillac's views on the analytical method. Some of Schütz's points apply to Hartley's views as well, but I will not belabour that here.

Schütz<sup>59</sup> characterized the analytic method as the 'method of arbitrary combination' (*willkürliche Verbindung*), thereby opposing Bonnet's talk of a 'method of dissection'. What prompted this obviously critical characterization? And what did Schütz think of Bonnet's demand that psychology use the analytical method? First of all, Bonnet's procedure is fairly fictional. While emphasizing the 'spirit of observation' (*l'Esprit d'Observation*; in Schütz: *Beobachtungsgeist*),<sup>60</sup> and maintaining that psychology—'just like physics'—rests 'on observation and experience',<sup>61</sup> Bonnet, like Condillac, rarely made what we would think of as genuine psychological observations or experiments. He made much more use of a *thought experiment*, namely the metamorphosis of a statue into a thinking being through the gradual awakening of each of its senses. As such, the method does seem arbitrary. The results of thought experiments are anything but uncontroversial, as Schütz's discussion of Condillac's analyses showed.<sup>62</sup> Schütz argued that many sensations attributed to one sense may actually depend on another. False attribution may result from conceptual fuzziness and confusion, of which Condillac and Bonnet were both guilty.<sup>63</sup>

57 Sturm T., "Christian Gottfried Schütz", in Kuehn M. – Klemme H. (eds.), *The Dictionary of Eighteenth-Century German Philosophers* (Bristol: 2010) 1071–1074.

58 See Sturm, *Kant und die Wissenschaften vom Menschen* ch. 11.

59 Schütz Christian Gottfried, "Betrachtungen über die verschiednen Methoden der Psychologie; nebst einem kritischen Auszug aus des Hrn. Abt von Condillac *Traité des sensations*", *Karl Bonnets Analytischer Versuch über die Seelenkräfte*, trans. Christian Gottfried Schütz (Bremen: 1771) 205; cf. ibidem 269.

60 Bonnet, *Essai analytique* i–ii.

61 Ibidem xvii.

62 Schütz, "Betrachtungen" 206–263.

63 Ibidem 252f.



Furthermore, why should the olfactory sense and not, for instance, the sense of touch constitute the 'basis of all sensibility' (*Grundlage der ganzen Empfindlichkeit*)?<sup>64</sup> After all, the latter arouses important ideas of extension, motion, shape, solidity, and so on, upon which, for instance, some visual perceptions depend.<sup>65</sup> Also, Condillac supposed that once the statue had had a series of different olfactory sensations, this would enable it to create 'abstract concepts [...] of quantity, indeed, even of possibility and impossibility, of duration, etc.'<sup>66</sup> In contrast, however: 'The statue's soul may have a notion of a better state; but it would be very vague; she is not in a position to reflect on it, or to have general concepts of it.'<sup>67</sup> What is more, *factual* observations invalidate the claims allegedly derived from such analyses: 'A two-year-old child doubtlessly exhibits many of the same features as the statue; it has learned to use all of its five senses, and yet, where are its concepts of possibility, unity, quantity, and duration?'<sup>68</sup>

Not only were Bonnet's and Condillac's observations and the insights gained therefrom largely fictitious, but the way explanations were justified faltered too. As Bonnet conceded,<sup>69</sup> he first and foremost formulated hypotheses, and remarked that he was aware of the difficulties of grounding hypotheses in the analytical manner.<sup>70</sup> He did not, however, explain how to remedy this. In particular, his additional step of moving from psychological to physiological explanations consists largely of purely speculative assumptions.<sup>71</sup> Even if one abstracted from this step, other problems remained. Schütz named several

64 Ibidem 207.

65 Ibidem 237–263. In this context Schütz also provides responses to Molyneux's famous problem. The assumption that the sense of touch is the most basic and especially important for the contents of visual perception—the perception of distance, size, or shape—must be seen against the backdrop of the eighteenth century's discourse on optics and perceptual theory; see Hatfield G., *The Natural and the Normative: Theories of Spatial Perception from Kant to Helmholtz* (Cambridge, MA: 1990) 32–45.

66 '[...] abstracte Begriffe [...] von der Zahl, ja sogar vom Möglichen und Unmöglichen, von der Dauer, etc.'—Schütz, ibidem 220.

67 'Die Seele der Statue kann eine Vorstellung von einem besseren Zustande haben; aber diese ist höchst undeutlich; sie befindet sich nicht im Stande darüber zu reflectiren, oder allgemeine Begriffe davon zu haben'—ibidem.

68 'Ein Kind von zwey Jahren hat ohne Zweifel viele Vorzüge vor der Statue in der itzt vorausgesetzten Lage; da es alle seine fünf Sinne schon hat brauchen lernen; und gleichwohl, wo sind hier die Begriffe von der Möglichkeit, Einheit, Zahl und Dauer?'—ibidem 221f.

69 Bonnet, *Essai analytique* 2.

70 Ibidem xvi and xix.

71 E.g., ibidem 17–24.

flaws of this understanding of the analytic method as a way of detecting explanatory principles. They concern difficulties that arise when analyzing complex phenomena into sub-phenomena for inferring explanatory principles, as well as difficulties in such inferences themselves:

Part of doing this [kind of] analysis correctly involves [having] a vivid, yet orderly imagination that allows one to transcend experience without going astray. When dissecting concepts one must take care not to simultaneously destroy what is essential to them; or afterwards, to put them back together the wrong way. [...] One must also beware not to want to conclude more from simple principles than can really be concluded from them in an unforced manner. Perhaps Mr. de Condillac, in his *Essay*, and Mr. Bonnet, in his *Analysis*, have not always avoided this sufficiently; the former ascribing abstract concepts to the statue that has only a few senses; the latter letting the single sense of smell set all of the soul's forces in motion. And finally, one need not end up with chimerical premises; like Mr. de Condillac does, in awakening the olfactory sense in the statue without first furnishing her with sentiment—something which presumably cannot be.<sup>72</sup>

How does one know in analyzing a phenomenon that one has not gone too far, or that one has not divided a phenomenon into more sub-phenomena than are appropriate for an analysis? How does one know that the chosen principle really explains certain phenomena if one has not tested or cannot test it experimentally? How does one know that one has arrived at the fundamental principles of the mind and not at 'chimerical premises'? These are legitimate questions. The first two are of particular concern given that Bonnet engaged

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72 'Es gehört zu dem richtigen Gebrauche dieser Analyse, eine lebhaft, aber doch wohlgeordnete Einbildungskraft, womit man über die Erfahrungen hinausgehen könne, ohne sich zu verirren. Man muß sich in acht nehmen, indem man die Begriffe zergliedert, daß man nicht zugleich das wesentliche desselben mit zerstöre; oder sie hernach wieder unrecht zusammensetze. [...] Man muß sich ferner hüten, nicht mehr aus den einfachen Prinzipien herleiten zu wollen, als sich wirklich auf eine ungezwungene Art daraus herleiten läßt. Vielleicht hat Herr von Condillac in seinem *Versuche*, und Herr Bonnet in seiner *Analyse*, dieses nicht immer genug vermieden; indem er seiner Statue bey dem Gebrauche weniger Sinne schon abstracte Begriffe beylegt; dieser bey dem einzigen Sinne des Geruchs alle Seelenkräfte in Bewegung bringt. Endlich muss man auch nicht auf schimärische Voraussetzungen geraten; wie etwa Herr von Condillac seiner Statue zuerst den Sinn des Geruchs öffnet, ohne ihr Gefühl beygelegt zu haben, welcher Fall vermutlich gar nicht existieren kann'.—Schütz, "Betrachtungen" 269.

more in thought experiments than in empirical research. The third question concerns the inference to principles of explanation from statements about observed facts (as does part of the second question). Schütz's considerations rest on a logical point that is well known nowadays: if phenomena are deduced from causal principles, only those phenomena have been derived 'by way of demonstration'; the explanatory principles themselves have not. To vindicate the truth of an explanatory principle by the fact that it explains observational facts, or because one can derive statements about hitherto unexplained facts from it, is to commit a formal fallacy.<sup>73</sup>

Moreover, Schütz's objection is not merely abstract. It reflects a controversy of the times: How many and which basic powers are needed to explain mental activity? Is the capacity for pleasure and pain a basic capacity? Or is it a composite? Of which capacities? Eighteenth-century debate began with the question of whether, as Leibniz and Wolff had assumed, the mind has one 'fundamental power' (*Grundkraft*) from which all other individual powers can be derived, or whether it consists of several irreducible basal powers.<sup>74</sup> Those arguing against the notion of a *vis representativa* typically claimed that thinking and desiring are two irreducible capacities, and that this division is exhaustive. Others demanded still further basic faculties.<sup>75</sup> What evidence did they have? Inasmuch as they offer any, they suggest the difference one personally experiences between acts of thinking and acts of desiring. For instance, Johann Nicolas Tetens<sup>76</sup> assumed, like Bonnet, that 'we can only distinguish and characterize powers by the effects they produce'. Regarding the theory of *vis representativa*, he argued that *representatio* is merely the repetition of a previous impression; but how can our 'voluntary and intentional endeavors, activities, actions' come forth from ideas alone?<sup>77</sup> He also attacked monism in theories

73 It is a case of *affirming the consequent*. This can be shown as follows. (i) If the causal explanatory principle *G* is true, then (under certain conditions) a specific single observational statement *E* is true. (ii) *E* is true (as evidenced by observation). (iii) Therefore, *G* is true. Since (iii) does not follow from (i) and (ii), then (iii) can be false even if (i) and (ii) are true. See Lipton, *Inference to the Best Explanation* 18f. For this reason the model of inference to the best explanation needs considerable amendment at the least.

74 Crusius Christian August, *Entwurf der nothwendigen Vernunft-Wahrheiten*, in *Die philosophischen Hauptwerke*, vol. 11, ed. G. Tonelli (Hildesheim: 1964) 861f., went so far as to postulate a single basic power for each mental content that occurs.

75 See Sturm, *Kant und die Wissenschaften vom Menschen* 60, 99f.

76 Tetens, *Philosophische Versuche* 1, 733.

77 Ibidem 1, 691–695.

about the capacity for ideas, and—like Kant—found the feeling of pleasure and pain a further candidate for a basal mental capability.<sup>78</sup>

These refinements were considered advances in psychological knowledge. Just why that is so remained unclear, however, since the underlying systems of fundamental powers were not convincingly grounded, and since no reflection was made on whether it is even possible to find grounds for them. With its vague demand for a correct ‘dissection’ of phenomena, the analytic method could not solve this problem; it accentuated it. At any rate, Schütz’s remark that the analytical method is a method of ‘arbitrary combination’ fitted in well. The derivation of causes from observed effects alone is not a sufficient foundation for explanation.

What enhancement did the analytic method need? One obvious step would be to complement it with the synthetic method. Remember that Newton<sup>79</sup> considered the two methods complementary. What is ‘discovered’ by the analytic method must subsequently be proven more thoroughly by the synthetic method. More importantly, the second step is not merely to achieve proof-like presentation: it further supports the claim that a causal explanation is part of a comprehensive and systematic theory and thus well founded.

Of course, from a twenty-first-century perspective objections would remain. But they need not be pursued here: Bonnet and almost all other psychologists of the time conspicuously avoided any explicit mention of the synthetic method.<sup>80</sup> For them, merely developing hypotheses using the analytical method appeared to be a viable procedure. Although shunning the synthetic method dims the prospects, even Schütz argued that it cannot reasonably be used in psychology. He did not explicitly charge any single author with advocating the synthetic method. He wrote that in seeking ‘knowledge of the soul’ (*Erkenntniß der Seele*) attempts had been made to ‘explore its various powers’ (*Untersuchung ihrer verschiedenen Kräfte*), to ‘philosophize from abstract concepts’, to ‘draw conclusions from irrefutable basic principles, and thus to string together a series of tenets’ (*aus abstracten Begriffen zu philosophiren, aus*

78 Ibidem I, 734–737; on Kant, see Sturm, *Kant und die Wissenschaften vom Menschen* 372f., 379–381.

79 Newton, *Opticks* 404f.

80 It is possible that Bonnet waived the synthetic method because of Condillac’s judgement of it as merely formal or trivial (together with his enthusiasm for the analytic method). Other authors, such as Denis Diderot, were also critical (Koertge, “Analysis as a Method of Discovery” 153; Hankins, *Science and the Enlightenment* 21). The synthetic method played a minor role in the reflections of the psychologists and anthropologists of the times. A late and insubstantial exception is Abicht, J.H., *Psychologische Anthropologie* (Erlangen: 1801), especially 5f.

*unumstößlichen Grundsätzen Folgerungen herzuleiten, und so eine Reihe von Lehrsätzen aneinander zu ketten*). Synthetic procedures, however, are ‘rarely expedient’ in psychology: ‘Here are nothing but individual facts; what use are general principles? complex and compound incidents; what use is a basis of simple notions?’<sup>81</sup> In putting it thus, Schütz problematically altered the nature of the synthetic method by characterizing it as merely an isolated outcome of concepts and principles that have been developed by non-empirical procedures. This disregards the view of the synthetic method as aiming to integrate all causal explanation in empirically adequate theories that are as all-inclusive as possible. In one sense, however, Schütz was right about the problematic situation of psychology at the time: one could not take the availability of a systematic body of basic psychological principles for granted. The objections to Condillac’s sensualism and those to a monistic fundamental power of the mind are evidence of this. I abstain from judging whether the situation is much better today.

To sum up, Schütz raised at least three objections against the analytic method.

- (i) Analyses may move arbitrarily from complex phenomena to sub-phenomena.
- (ii) Inferring from effects to causes (or explanatory principles) may be arbitrary.
- (iii) The explanatory principles lack empirical testing and the conclusive grounding established by embedding in a comprehensive theory.

These objections are not unrelated. Since the thought experiments presented as ‘analyses’ are themselves problematic (i), the resulting explanatory principles for basic mental capacities (and their physiological correlates) are also problematic (ii), and since the explanatory principles are mere hypotheses, for which one may easily find alternative explanations, they need crucial empirical testing, which is wanting (iii). But what alternatives remain?

Schütz appreciated Bonnet’s and Condillac’s studies in certain respects, but in the end he said that in psychology the analytic method should only be used when experiments are entirely out of the question—for example when

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81 ‘Hier sind lauter einzelne Facta; wozu also allgemeine Grundsätze? verwickelte und zusammengesetzte Begebenheiten; wozu hier die Grundlage ganz einfacher Notionen?’—Schütz, “Betrachtungen” 272.

examining ‘whether humans left to themselves would invent a language’.<sup>82</sup> Schütz also preferred empirical methods (introspection where possible and reasonable behavioural observation, and the study of human physiology as it relates to mental phenomena) to both the analytic and the synthetic method.<sup>83</sup> This remark may appear misleading. Do these empirical methods compete with the analytic method at all? The chief function of observation is to determine facts; that of the analytic method is to develop causal explanations for those facts. However, Schütz’s remark was aimed at the tendency in Condillac’s and Bonnet’s versions of the analytic method to use thought experiments instead of real empirical research to support their explanatory hypotheses. In the light of the objections he raises, in the end Schütz himself was obviously at a loss since all he could manage was to vaguely suggest combining all three methods:<sup>84</sup> the empirical method should serve to observe the mind, the analytic method to devise hypotheses based on observations, and the synthetic method to deduce phenomena from hypotheses. He provided no convincing example for this integration of methods, and generally left the question of whether it can or cannot be achieved for psychology open.

### Conclusion

I have shown not only that Newton’s methods of analysis and synthesis were appropriated by authors trying to improve the human sciences in the eighteenth century—especially psychology and psycho-physiology—but also that this was done in a variety of ways. Even so, none of the proposals was good enough to lead to the development of a science of the mind or behaviour that would even remotely resemble Newton’s mechanics or optics. Why was this so? The answer to this question will probably be complex, involving different disciplines, different versions of the analytic and synthetic methods, and different levels of sophistication as devised by those who transferred the method(s) into the human domain. So, while the question cannot be answered completely here, I offer three important considerations in this regard.

First, the authors discussed did not necessarily apply Newton’s advice blindly or superficially, but at least sometimes tried to adapt it to their domains, theoretical assumptions, and questions. Still, it must be said that that this transfer of the method(s) involved some losses. For instance, Hartley presumed to use

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82 ‘[...] ob Menschen, die sich selbst überlassen sind, für sich eine Sprache erfinden können [...]’—Schütz, “Betrachtungen” 272.

83 Ibidem 263 and 272f.

84 Ibidem 272f.

Newton's methods, but did not seriously consider alternative explanations to his hypotheses, as was pointed out especially by Reid. Bonnet, again, assumed that he could improve psychology by using only the analytic method, against which Schütz raised important objections.

The second point is that while Newton did not explicitly demand the use of mathematical tools within his characterization of the methods of analysis and synthesis in the *Opticks*, in natural science such tools served to develop precise, and therefore more testable, laws. This further constrained the inferences from observed effects to explanatory causes.<sup>85</sup> To be fair, quantification and measurement did enter the human sciences in the eighteenth century. But they did so in the form of rather simple arithmetical and geometrical calculations—as in optical, acoustical, or psychological experiments on the senses—or of probability theory and descriptive statistics—especially in history or economics—and mostly without connections to causal explanations.<sup>86</sup>

Third and finally, in natural science, the methods were bound to conceptual and theoretical frameworks of matter, motion, and force that placed further constraints upon the acceptable inferences. To establish such a framework in the human sciences would have required more arduous work than could be carried out by a single author, or even a small group. Perhaps it would also have required new ways of thinking about the human sciences. To mention one example of a thinker who took a quite different road, within his own psychological or anthropological work, Kant developed a systematic theory of why certain mental capacities—cognition, feeling, and desire—are basic, and also argued for a systematic understanding of their necessary connections. He argued that we must see them as so related if we are to gain an understanding of human beings as rational agents, and explain their actions accordingly. Even though his approach did not rule out a physiological underpinning of mental states and capacities, it made it superfluous within his 'pragmatic' approach to sciences such as anthropology and history. This had also consequences for what methods he viewed as appropriate to these disciplines. All of this, however, is another story.<sup>87</sup> The point remains that methods that work well do not work alone. They need to be connected to suitable theoretical and conceptual assumptions, and to be accompanied by convincing empirical applications. A mindless transfer of methodological doctrines from one scientific domain to another will not succeed.

85 I am grateful to Eric Schliesser for pushing me to make this point.

86 See Sturm T., "Is There a Problem with Mathematical Psychology in the Eighteenth Century? A Fresh look at Kant's Old Argument", *Journal of the History of the Behavioral Sciences* 42 (2006) 353–377; Sturm, *Kant und die Wissenschaften vom Menschen* ch. IV.

87 Sturm, *Kant und die Wissenschaften vom Menschen* chs. V and VII–VIII.



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# The Science of Man and the Invention of Usable Traditions<sup>1</sup>

*Eric Schliesser*

## Summary

In this paper, I scrutinize three sets of passages by David Hume. The first is from the Introduction to *A Treatise of Human Nature*; the second is from “An Abstract of a Book lately Published, entitled, A Treatise of Human Nature;” the third is really a collection of widely scattered vignettes from *The History of England from the Invasion of Julius Caesar to the Revolution in 1688*. I argue that, in these works, Hume creates several distinct intellectual traditions leading up to him. I argue that the changes among them reflect, in part, tactical moves in response to changed circumstances and, in part, Hume’s changed understanding of the epistemic virtues underlying his project’s relationship to the ‘system’ of science. For example, I trace how high praise for Bacon and Locke gets replaced by praise for Galileo, Boyle, and Newton. While this little noticed aspect of Hume’s thought has independent interest, focusing on Hume’s historiographical strategy also helps illuminate Hume’s evolving understanding of the ‘science of man’ within the system of sciences.

## Introduction

In this paper, I scrutinize three sets of passages by David Hume. The first is from the Introduction to *A Treatise of Human Nature*;<sup>2</sup> the second is from *An*

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- 1 This paper was inspired by reflection on my exchanges with Silvia Manzo over her “David Hume and Copernicanism” presented at the Hume Society, Halifax, August 2009; it is also a companion piece to Schliesser E., “The Obituary of a Vain Philosopher: Adam Smith’s Reflections on Hume’s Life”, *Hume Studies* 29 (2003) 327–362, where, among other things, I argued that in “My Own Life”, Hume attempts to fix the canon of his writings.
  - 2 Hume David, *A Treatise of Human Nature*, ed. D.F. Norton – M. Norton (Oxford: 2007 [1739–1740]), hereafter *Treatise*. This edition includes Hume’s *Abstract*. I refer to both texts by paragraph (e.g., T 1.3.14.24).

*Abstract of a Book lately Published, entitled, A Treatise of Human Nature* (hereafter *Abstract*); the third is really a collection of widely scattered vignettes from *The History of England from the Invasion of Julius Caesar to the Revolution in 1688*.<sup>3</sup> I argue that, in these works, Hume creates several distinct intellectual traditions leading up to him. I argue that the changes between them reflect, in part, tactical moves in response to changed circumstances and, in part, Hume's changed understanding of the epistemic virtues underlying his project's relationship to the 'system' of sciences. For example, I trace how high praise for Bacon and Locke gets replaced by praise for Galileo, Boyle, and Newton. While this little noticed aspect of Hume's thought has independent interest, focusing on Hume's historiographic strategy also helps illuminate Hume's evolving understanding of the 'science of man' within the system of sciences.

In the next section, I show how in the *Treatise* Hume presents himself as a modern Socrates, simultaneously heir to and transformer of a distinctively and fairly recent English tradition. I also explain the function of Hume's self-invention. In the following section I call attention to some important shifts between the *Treatise* and its summary in the *Abstract*. In the final section I show that in the *History* Hume re-invents himself as an heir to an entirely different, more cosmopolitan tradition, which has developed over many centuries. Nevertheless, in the *History*, Hume re-uses the language of 'true philosophy' to assert subtly the primacy of the science of man.<sup>4</sup>

### The New Socrates Invents Tradition

The main point of my paper is to provide a careful analysis of the following lines. My motivation for doing so is that they are interesting in their own right, but they can shed some light on Hume's understanding of the 'science of man' with his system of sciences. I quote the main passage before I comment:

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3 Hume David, *The History of England from the Invasion of Julius Caesar to the Revolution in 1688*, ed. and introd. W.B. Todd, 6 vols. (Indianapolis: 1983 [1754–1762]), but revised until the end of his life; hereafter *History*.

4 One methodological clarification: while I use the language of 'invention', in the body of argument I am less interested in characterizing Hume's mental state or intentions than I am in how Hume 'presents' himself to a knowledgeable reader. This is one reason why in what follows I draw on Hume's published writings and historical events, but not, generally, on his (more private) letters (or biographical materials).

'Tis no astonishing reflection to consider, that the application of experimental philosophy to moral subjects shou'd come after that to natural at the distance of above a whole century; since we find in fact, that there was about the same interval betwixt the origins of these sciences; and that reckoning from THALES to SOCRATES, the space of time is nearly equal to that betwixt my Lord Bacon and some late philosophers in England, who have begun to put the science of man on a new footing, and have engag'd the attention, and excited the curiosity of the public. So true it is, that however other nations may rival us in poetry, and excel us in some other agreeable arts, the improvements in reason and philosophy can only be owing to a land of toleration and of liberty. Nor ought we to think, that this latter improvement in the science of man will do less honour to our native country than the former in natural philosophy, but ought rather to esteem it a greater glory, upon account of the greater importance of that science, as well as the necessity it lay under of such a reformation.<sup>5</sup>

This passage has received remarkable little scholarly attention. I offer three observations that are introductory to my historiographical exploration.

First, Hume is addressing a *national* 'public' (note the repeated 'us' and 'we' in the context of 'our native country,' and 'other nations'). Even though contemporary scholars tend to classify Hume as a member of the 'Scottish' Enlightenment, Hume's *Treatise* was published in London and is probably addressing itself to the public of a then not so ancient United Kingdom since the Union (of parliaments) of 1707. In the (oft-ignored) 'Advertisement' to the *Treatise*, Hume explains why he presents to the public only two (on the 'understanding and passions') out of '[...] all the subjects [...] that are [...] plann'd out [...] to himself 'in the Introduction'.<sup>6</sup> Besides the internal cohesion of the topics, Hume mentions that he 'was willing to take advantage of this natural division, in order to try to taste the of the public'.<sup>7</sup> Now, Hume is being ambiguous here. To 'perform a trial' means doing a test or an experiment.<sup>8</sup> But is Hume i) testing whether the public's response says something about the quality of his work or ii) testing the quality of the taste, or, 'judgment' of the public, or (more

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5 Hume, *Treatise* Introduction, 7–8.

6 Hume, *Treatise* Advertisement.

7 Ibidem.

8 This reveals something of the judicial origins of the language of modern science (even if trials may have their origin in duels, which trial the will of God, etc.). See Shapin S., *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: 1994).

far-fetched, perhaps) iii) trying to cultivate or create a new public? The ambiguity is not resolved but only deepened by the last line of the advertisement: 'The approbation of the public I consider as the greatest reward of my labours; but am determin'd to regard its judgment, whatever it be, as my best instruction'. Whatever Hume intended, in one respect the trial was, as most people know, no success. In one of the very last pieces he wrote, his autobiographical *My Own Life*, Hume noted (with considerable exaggeration) that '[n]ever literary attempt was more unfortunate than my *Treatise of Human Nature*. It fell dead-born from the press, without reaching such distinction as even to excite a murmur among the zealots [i.e., intolerant Christians]'.<sup>9</sup>

Above, I suggested that Hume probably addressed himself to a public that is committed to the union. But one might worry that he only mentions 'England' not Scotland. The objection gathers force from the fact that in the dramatic 'conclusion' of Book I of the *Treatise*,<sup>10</sup> he admits that he wishes 'not to make philosophers' out of the 'many honest gentlemen' in 'England, in particular'.<sup>11</sup> At most, he wishes to bring 'the science of man [...] a little more into fashion'.<sup>12</sup>

Nevertheless, there is evidence that in the Introduction to the *Treatise* with 'England', Hume did mean the whole union as in the places where English is spoken. For Hume adds his own footnote to the phrase quoted earlier, 'my Lord Bacon and some late philosophers in England'; the footnote reads, 'Mr. Locke, my Lord Shaftesbury, Dr. Mandeville, Mr. Hutcheson, Dr. Butler, etc.' Locke, Shaftesbury, and Butler were English. Mandeville, born a Dutchman, may qualify as an honorary Englishman because for most of his productive career in medicine and as controversial man of letters he lived and worked in and around London, writing mostly in English. But the inclusion of Francis Hutcheson, who was born a Scottish Presbyterian in Ireland, educated in Glasgow, and after a considerable hiatus, returned to Glasgow, suggests the wider, Unionist, definition of 'England'.<sup>13</sup> I return to this fivesome shortly. First, however, I explain the interest of Hume's addressing a national audience.

9 The book was evidently widely enough read to create forceful opposition to Hume's efforts to be appointed a university position.

10 Hume, *Treatise* 1.4.7.

11 Ibidem 1.4.7.14; I have conflated two sentences, but for the present purposes this does not matter.

12 Ibidem 1.4.7.14.

13 My argument allows that not all English-speaking parts of the British kingdom are included. The nub is that Hume excludes non-English speaking authors that were part of a wider debate. For example, Butler refers to Rochefoucauld in the preface to his *Sermons* and Shaftesbury also alludes to him occasionally.

The relevance of Hume's audience pertains to a second point about this passage from the introduction of the *Treatise*. Hume claims that 'toleration and liberty' are a necessary condition for 'improvements in reason and philosophy'. It is hard to tell if Hume is being sincere or highly ironic here. The list after all includes Locke, who was a refugee in Holland (the place then most known for its toleration and liberty), and Mandeville, who sometimes thought it wiser to publish anonymously—his famous *Fable* was taken to court at least once (Lest we forget: Hume's *Treatise* was also published anonymously). On the front page of the *Treatise*, Hume has a famous quotation from Tacitus's *Histories* (here in the Nortons' translation): 'The rare good fortune of an age in which we may feel what we wish and say what we feel'.<sup>14</sup> Paul Russell has seen in this a nod to Spinoza's *Theological Political Treatise*. Either way, Russell nicely observes that the use of this quotation signalled to some of Hume's contemporaries Hume's 'free thinking' intentions.<sup>15</sup> Moreover, we know that, before publication, Hume removed what he calls the 'nobler parts' of the *Treatise*; he performed 'this piece of cowardice' partly in order to avoid controversy with Butler.<sup>16</sup> It is thus hard to imagine Hume wholly believed that he lived in an age in which he may feel what he wishes and say what he feels; this is why I suspect he is flattering (or cultivating) his public.

Third, the official point of the list of names is to support a kind of self-aggrandizing comparison of the form A:B=C:D, that is, Thales to Socrates is equal to Bacon to Hume. In particular, if Thales is the original founder of natural philosophy and Socrates the original founder of moral philosophy, Hume treats Bacon as re-founder of natural philosophy by being the first to introduce the experimental method to natural philosophy, and himself as a Socratic re-founder to introduce experimental method to moral philosophy.<sup>17</sup> In the

14 Even if we leave aside political matters, the focus on feeling (*sentire* in the Latin) resonates with Hume's substantive epistemic and moral doctrines.

15 Russell P., *The Riddle of Hume's Treatise: Skepticism, Naturalism, and Irreligion* (Oxford: 2008) 71ff.

16 See Hume's letter to Henry Home, later Lord Kames, December 1735, quoted in Millican P. (ed.), *Reading Hume on Human Understanding: Essays on the First Enquiry* (Oxford: 2002) 35.

17 Sandy Stewart objected that 'the relationship that matches "Thales to Socrates" is "Bacon to some late philosophers in England". Hume sees himself as heir to and improver on those late philosophers, and therefore as the analogue of one or more of the intellectual heirs of Socrates, not of Socrates himself' (emphasis by Stewart). If the objection stands, then Hume is in the position of a student (Plato?) of Socrates. But while attractive, this objection subtly misreads Hume's claim, which is 'that reckoning from THALES to SOCRATES, the space of time is *nearly equal* to that betwixt my Lord Bacon and some late philosophers in England' (emphasis added). Between the death of Thales and Socrates,



*Treatise*, Hume nowhere again mentions Thales, Bacon, or Socrates.<sup>18</sup> Hume's account of Thales and Socrates is probably influenced by Cicero's *Academica*, as his modern editors suggest.<sup>19</sup> But Hume may have also been thinking of Anthony Collins's *A Discourse of Free-Thinking: Occasion'd by the Rise and Growth of a Sect Call'd Free-Thinkers*. Collins describes Socrates as follows:

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- adulthood is 'distance of above a whole century'. Between the death of Bacon and the writings of, say, Locke (the oldest) of the 'late philosophers' is much less elapsed time. Bacon died in 1626; the publication of Hume's *Treatise* makes the analogy 'equal'.
- 18 In *The Natural History of Religion* (NHR) Hume treats Thales as a kind of pious Spinozist: 'It will be easy to give a reason, why *Thales*, *Anaximander*, and those early philosophers, who really were atheists, might be very orthodox in the pagan creed; and why *Anaxagoras* and *Socrates*, though real theists, must naturally, in ancient times, be esteemed impious. The blind, unguided powers of nature, if they could produce men, might also produce such beings as *Jupiter* and *Neptune*, who being the most powerful, intelligent existences in the world, would be proper objects of worship. But where a supreme intelligence, the first cause of all, is admitted, these capricious beings, if they exist at all, must appear very subordinate and dependent, and consequently be excluded from the rank of deities. *Plato* (de leg. lib. x.) assigns this reason for the imputation thrown on *Anaxagoras*, namely his denying the divinity of the stars, planets, and other created objects' (N [zz].1, Bea 47; see also N 4.10). Thales and Anaximander are treated as proto-Spinozists with a twist, by offering a cosmogony which is deity-free and without providence, yet not impious. I have consulted the version of the 1777 edition of Hume, David, *Essays and Treatises on Several Subjects* (London, A. Millar: 1758) as reproduced at URL = <www.Davidhume.org>. By contrast, while Adam Smith agrees that Thales was the founder of one of the first 'philosophical sects' (Astronomy 3.6, EPS 52), following the authority of Aristotle, Smith treats the accounts by Plutarch and Apuleius of Thales's astronomical discoveries as historical fictions, and presents Thales's cosmology as an anthropocentric and 'confused an account of things'. See Smith Adam, "The History of Astronomy" 4.5, in idem, *The Glasgow Edition of the Works and Correspondence of Adam Smith. Vol. III: Essays on Philosophical Subjects*, ed. W.P.D. Wightman – J.C. Bryce (Indianapolis: 1982 [1795]) 56. For the significance of this difference see Schliesser E., "Hume, Smith, and the Posidonian Argument", under consideration.
- 19 In what follows, I use Collins to characterize what might have attracted Hume to Socrates. But a referee has objected that it is unlikely that Hume would be modelling himself as a modern Socrates because in *The Natural History of Religion* Socrates is treated as a theist. Let us allow (in order not to complicate matters) that Hume's view of Socrates was stable throughout his life. In NHR all mentions of Socrates are treated in context as instances of the 'superstition' that Socrates faced (or of evidence of Xenophon's superstition). Moreover, as many commentators have noticed NHR embraces theism; so Hume's description of Socrates embracing 'real theism', cannot be used as evidence that Hume saw an important difference between himself and Socrates. Of course, there is a sense in which the movement from Thales to Socrates in NHR is described as the development of an increasingly superstitious cosmogony.

[T]he divinest Man that ever appear'd in the heathen world, and to whose virtue and wisdom all ages since have done justice, was a very great *Free-Thinker*. He not only disbeliev'd the *Gods* of his country, and the common Creeds about them [...] but obtain'd a just notion of the nature and attributes of God, exactly agreeable to that which we have receiv'd by divine revelation, and became a true *Christian* [...] For JUSTIN MARTYR tells us, *That CHRIST, the first-begotten of God, is reason, of which all mankind are partakers* [...] Socrates could not suppos'd to have made notions, or speculations, or mysteries, any parts of his Religion, when he [quoting Xenophon] *demonstrated all Men to be fools who troubled themselves with inquiry's into heavenly things, and ask'd such inquirers whether they had attain'd a perfect knowledg of human things, since they search'd into heavenly things; or if they could think themselves wise in neglecting that which concern'd them, to employ themselves in that which was above their Capacity to understand.*<sup>20</sup>

That is, Collins describes Socrates as somebody who privileged moral philosophy over natural philosophy because the former is more useful (recall, 'concerned them'). Moreover, Collins treats Socrates as a sceptic about possible knowledge of celestial sphere.<sup>21</sup> Hume may have also been attracted to Collins' description of Socrates' (Spinozistic) ridicule of anthropomorphizing God.<sup>22</sup> Of course, Bacon and Hume are treated as innovating experimental philosophers, not mere copyists of Thales and Socrates. This is why one noted Hume scholar, John Wright, has sensibly linked this passage with the subtitle to Hume's *Treatise* ('Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects'). Hume's experimental method, then, has its origin in Baconian (and not Newtonian) science.<sup>23</sup> And this is apparently confirmed by Hume's claim in the *Abstract*, that the author of the *Treatise* 'considers' Lord Bacon 'as the father of experimental physics'.<sup>24</sup>

20 Collins Anthony, *A Discourse of Free-Thinking: Occasion'd by the Rise and Growth of a Sect Call'd Free-Thinkers* (London: 1713) 103–104; emphasis in original; Collins goes on to describe Socrates' fate. Russell, *The Riddle of Hume's Treatise* calls attention to this passage, although for slightly different purposes.

21 If one can show that the Humean philosopher avoids certain species of speculation, then he is a kind of modern Socratic.

22 See Collins, *Discourse* 123.

23 Wright J., *The Skeptical Realism of David Hume* (Manchester: 1983) 188–197. This corrects my earlier blindness to this significant point!

24 Hume, *Abstract* 2.

So, what to make of Hume's fashioning himself as a kind of modern experimentalizing Socrates and why does he list 'Mr. Locke, my Lord Shaftesbury, Dr. Mandeville, Mr. Hutcheson, Dr. Butler' in one group (not to mention those who might be included in that elusive 'etc.')? I have five observations in response to these two questions. One modest point is that even 'toleration and liberty' require time and the successive interactions of several generations of thinkers to produce their desirable effect in the intellectual world. Second, in the *Treatise*, Hume's explanation for the grouping is quite straightforward: these men have two things in common: first they have 'begun to put the science of man on a new footing' and, second, they 'have engag'd the attention, and excited the curiosity of the public'. The latter point helps us see that Hume claims there was already, to some extent, a 'public' for the *Treatise*.

But if Hume is the first to introduce the 'experimental method' into moral subjects, what is the new, but presumably not entirely solid footing that unites the five post-Baconian 'English' thinkers in the list? In the *Abstract* that Hume wrote of the *Treatise*, the answer to this question is that they founded 'their accurate disquisitions of human nature entirely upon experience'.<sup>25</sup> This is a plausible answer, but (as I argue below) the *Abstract* needs to be treated with caution because there are also subtle differences between it and the *Treatise*.

Nevertheless, this answer might help explain the otherwise surprising omission of Hobbes in this list. I call the omission surprising for two reasons: a) Hobbes is the explicit and implicit target of the five listed thinkers on many matters; b) the same is true of Hume, who may have had Hobbes open at his writing desk at several places while composing the *Treatise*.<sup>26</sup> Yet, from Hume's point of view, Hobbes's approach is too rationalistic and too dogmatic. Evidence for this claim can be found in Hume's mini-biography of Hobbes's character in the *History*: 'Though an enemy to religion, [Hobbes] partakes nothing of the spirit of scepticism; but is as positive and dogmatical as if human reason, and his reason in particular, could attain a thorough conviction in these subjects [i.e., politics and ethics]'.<sup>27</sup> While we should be

25 Ibidem.

26 See especially Hume's treatment of justice. For discussion see Pack S.J. & Schliesser E., "Smith's Humeian Criticism of Hume's Account of the Origin of Justice", *Journal of the History of Philosophy* 44, 1 (2006) 47–63. Reid also has no doubt of Hume's Hobbesian leanings in some respects; see Reid Thomas, *Essays on the Active Powers of Man* (London: 1788) 437–438. One can claim this without accepting Paul Russell's more far-reaching claims about the relationship between Hume and Hobbes.

27 Hume, *History* Vol. VI. Chapter LXII.

cautious in citing Hume's *History* as evidence for views in the *Treatise* (I call attention to significant differences below) it fits nicely with his criticism of Hobbes's 'suppos'd *state of nature*' as a 'mere philosophical fiction, which never had, and never could have any reality'.<sup>28</sup> According to Hume, Hobbes is a dogmatic (and mistaken) rationalist in the science of man whose methodology is not based on experience. Of course, Hume's overall understanding of Hobbes is more complicated than this suggests, but that need not detain us here.

The fourth point is more mischievous: Hutcheson and Butler would not have been pleased to be put in one list together with the scandalous Mandeville, who successfully revived the (Hobbesian) 'selfish' hypothesis and was their frequent target. But the inclusion of Mandeville is also strategic, and this pertains to my final, fifth, point. Hume is *inventing* here an English-language tradition of moral philosophy at which he is a simultaneous natural (Socrates-like) endpoint and a new beginning.<sup>29</sup> I call him an 'endpoint' of this tradition because he self-consciously transforms the tradition he has just invented by introducing into it his methodological innovation (the experimental method). By grouping a number of authors together and emphasizing their commonalities in some crucial respects (that is, they put the science of man on a sound footing, i.e., experience, and incite the curiosity of public) he can ignore a) their (very real) differences and even their self-understanding of their aims (it is doubtful that most of them would wish to pursue a science of man without making it subservient to other purposes), and b) exclude other writers from consideration. For example, among English moralists, Hume omits mention of some of his targets—Clarke, Whiston, and Wollaston—and some of his allies: Addison and Steele, not to mention Swift and Berkeley.

There are several reasons why my speculative reading should not be dismissed out of hand. The fivefold list of authors is, after all, not the list of the authors that are most important to understanding the philosophy of Book 1 of the *Treatise*: as Hume writes to his friend Michael Ramsey, for that purpose Malebranche's *Search*, Berkeley's *Principles*, Descartes's *Meditations*, and Bayle's articles on Zeno and Spinoza, in particular, are far more relevant texts. With the exception, of course, of Locke, who figures prominently in Book 1 of the *Treatise*, the five English figures matter almost exclusively for the third

28 Hume, *Treatise* 3.2.2.14; emphasis in original.

29 To be clear: my argument still holds if it turned out that Hume was not the sole originator of this tradition, although this would be surprising. I thank a referee for pressing this point.

(and parts of the second) book of the *Treatise*, but certainly not for the *whole* science of man.

In present-day English language philosophical education (and this reflects to some, perhaps lagging, degree *our* philosophic self-conception), Hume is the third of the British Empiricists after Locke and Berkeley. As we have seen, Hume does not deny the importance of Berkeley to his friends, but this way of presenting things is not favoured by Hume in the *Treatise*. Hume *could* have presented himself as a development of the philosophy of Locke and Berkeley.<sup>30</sup> In the *Treatise*, Hume does not deny his debts to Berkeley and Locke; besides the mention in the introduction, Locke is also singled out in Hume's note on the first page of Book I and Berkeley is the only other philosopher to be mentioned in a note in the first part of Book I. So why does he focus on the 'gang of five' in the Introduction?

Hume's attempt at fashioning himself as the endpoint of an English tradition is informative about his intentions. In particular, it tells us something negative and something positive. On the negative side, Hume is trying to avoid being slotted into some categories familiar to his contemporaries. For example, the brilliant editor of the second edition of Newton's *Principia*, Roger Cotes, divides the learned world into three camps: the Scholastics, the pre-Newtonian Mechanical philosophers, and the Newtonian mathematical-experimental philosophers.<sup>31</sup> MacLaurin, the most prominent Scottish Newtonian of the first half of the eighteenth century, distinguishes between the modest, *free* (Newtonian) philosopher and the prideful, licentious (Cartesian) philosopher;<sup>32</sup> in Hume's day in some people's minds, 'Hobbist' became synonymous with

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30 This is not an anachronistic suggestion, because Hume's *Enquiry Concerning Human Understanding* (hereafter: first *Enquiry*) makes a clear movement from Locke to Berkeley. The first *Enquiry* invokes Locke in the first section and throughout the first few essays or sections introduces Locke as the main source and target. The first *Enquiry* ends with an invocation of Berkeley as the source of 'the most profound philosophy'; Hume comments that, even if Berkeley did not intend it, 'most of the writings of that very ingenious author form the best lessons of scepticism, which are to be found either among the ancient or modern philosophers'. Ken Winkler has nicely shown that in revisions to first *Enquiry*, Hume's rhetoric became ever more critical of Locke. Winkler K., *Matters of Reason: Essays in Early Modern British Philosophy* (Oxford: forthcoming). My debts to Winkler's argument are more diffuse than this footnote can state.

31 See Newton Isaac, *Philosophical Writings*, ed. A. Janiak (Cambridge: 2004) 43. My terminology is anachronistic, but it captures Cotes's three-fold division.

32 See MacLaurin Colin, *An Account of Sir Isaac Newton's Philosophical Discoveries*, 2nd ed. (London: 1750). On the negative virtues, see especially 38, 79 and 380. On Newtonian modesty, see 96 (quoted below), and the remarks on how 'liberty of enquiry' should not be

'Spinozist', which, in turn, often became synonymous (for some) with 'Atheists' or 'free-thinkers' or (in Berkeley's apt phrase) a 'minute philosopher' as opposed to the 'common sense' philosophy of, say, Berkeley. In the English speaking world, 'superstitious' often meant Catholic or 'popish,' and, thus, 'slavish' and opposed to the 'true religion',<sup>33</sup> not to mention the debate between 'plenists' and 'Epicureans' and so on. In the first *Enquiry*, Hume identifies 'Malebranche and other Cartesians' and opposes them at one point to 'Locke, Clarke, and Cudworth.' I therefore speculate that the negative part of the answer is that by constructing a tradition focused on the 'science of man', Hume attempts to escape being slotted into categories that are framed around pre-existing disputes.

On the positive side, by putting these thinkers together in a category (and cutting across their differences) he invites his reader to think there has been *some progress* toward truth in a *common* project. It is thus a response to the worry announced right on the first page of the *Treatise*: the threat of the 'common prejudice against metaphysical reasoning of all kinds, even amongst those, who profess themselves scholars'. According to Hume, this prejudice is the result of the fact that there appears to be no consensus in the world of the learned: 'there is nothing which is not the subject of debate, and in which men of learning are not of contrary opinions' and even 'the most trivial question escapes not our controversy'.<sup>34</sup> By identifying a tradition, Hume can say that despite the 'noisy' appearances, in reality there has been progress: 'the latter improvement in the science of man' (one might say, at home) in England, even if it lags in 'some other agreeable arts'. Hume is telling his readers that there are a group of thinkers that stand to Hume as the pre-Socratics stand to Socrates.

By pretending there has been a common project in which progress has been made, Hume can pretend to be taking a next step and thus deepen the tradition. The conceit of a common project is made explicit in the first sentence of Hume's Abstract, a work he published (anonymously) in 1740, several months before the publication of the third book of the *Treatise*. He wrote that '[t]his book seems to be written upon the same plan with several other works that have had a great vogue of late years in England'. I call it a 'conceit' because several of the authors in his list would have been horrified (or amused) by the thought they shared 'the same plan'—even if we leave aside conflicting religious and political goals, try to find the common plan in Mandeville's *Fable*,

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'abused' (6). For more details see Schliesser E., "The Newtonian Refutation of Spinoza", in Janiak A. – Schliesser E. (eds.), *Interpreting Newton: Critical Essays* (Cambridge: 2012).

33 See for this terminology, Hume's "Of Superstition and Enthusiasm".

34 Hume, *Treatise* Intro. 3.

Shaftesbury's *Characteristics*, Butler's *Sermons*, or Locke's *Essay*. Hume discerned what was common among them: to put it anachronistically, that moral psychology is in some sense foundational to ethics.<sup>35</sup>

Finally, I am not claiming that Hume is the first to use history in such an inventive fashion. In his day, this was a very common rhetorical strategy. For example, in his best-selling (1734) *Letters on the English*, Voltaire linked Descartes, 'who brought us to the path of truth and gave sight to the blind', with Bacon, Locke, and Newton and contrasted them favourably to Malebranche (see especially Letters 12–18; the quotation is from Letter 14).<sup>36</sup> We find a similar strategy in Barbeyrac's influential preface to his translation of Pufendorf's *Of the Law of Nature and Nations* (1729), "Containing an Historical and Critical Account of the Science of Morality, and the Progress It has Made in the World, From the Earliest Times Down to the Publication of This Work". According to Barbeyrac, reading Bacon inspired Grotius, who should 'be regarded, as the first who broke the ice' and put 'progress' in the science of the 'law of nature' on a solid footing; Grotius, in turn, was 'bravely followed' by Pufendorf (see especially sections XXIX–XXX).<sup>37</sup> While there are obvious differences among these narratives (with which Hume almost certainly was familiar) and Hume's, all pivot around Socrates as the crucial figure among the Ancients and a more recent revival in which Bacon looms large. The authors use the tradition they invent to pointedly include and exclude other relatively recent authors.<sup>38</sup>

35 Gill M., *The British Moralists on Human Nature and the Birth of Secular Ethics* (Cambridge: 2006) has found such a common plan, but that is, in part, because Hume teaches us how to read his British contemporaries (at the expense of his French and Dutch sources).

36 See Voltaire, *Letters Concerning the English Nation* (London, by J. and R. Tonson et al.: 1778) 104.

37 See Barbeyrac, *An Historical and Critical Account of the Science of Morality: and the Progress It has Made in the World, from the Earliest Time Down to the Publication of Pufendorf of the Law of Nature and Nations: in a Prefatory Discourse to the Said Work by Mr. Barbeyrac* (London, Walthoe: 1729) 79.

38 I am not claiming such historiography was standard during the period. The 'preface' to Butler's *Sermons*, for example, offers a distinction between 'two ways' in which morals can be treated: 'one begins from enquiring into the abstract relations of things; the other, from a matter of fact, namely, what the particular nature of man is, its several parts, their economy or constitution; from whence it proceeds to determine what course of life it is, which is correspondent to the whole of nature'—Butler Joseph, *Fifteen Sermons*, 2nd ed. (London: 1729) 14. One referee suggested that Hume adopts this distinction. Even if this were granted, Butler does not link up this tradition to particular authors.



I now turn to some striking shifts when Hume revisits and reworks this material first in the *Abstract* and then in the *History*, where his language conforms even more closely to the strategy of these three authors.

### Changes between the *Treatise* and the *Abstract*

Some readers may feel I take Hume's list of names too seriously. Nevertheless, in his *Abstract* Hume spends a surprisingly disproportionate amount of space on the passages I have just been discussing (three paragraphs out of thirty-five in the Nortons' edition). Hume at least thought these issues important. But he also makes some subtle changes to the way he contextualizes the tradition he has identified or invented. He drops Thales and Socrates altogether, for example. He also puts the English tradition in a *European* context of '[t]he philosophical spirit, which has been so much improved all over Europe within these last fourscore years'.<sup>39</sup> He also insists that the English 'seem even to have started a new kind of philosophy' which is to be *contrasted* with the Ancients, who are represented as almost entirely lacking a 'regular science' of morals.<sup>40</sup> While the Introduction to the *Treatise* had indicated that the modern development of learning structurally and temporally mirrors the Ancients, in the *Abstract*, Hume is unabashedly siding with the Moderns against the Ancients. At minimum he is willing to appropriate the rhetoric of the then famous battle between Ancients and Moderns to his own ends.

Another shift, if not outright misrepresentation, is that in the *Abstract* Hume claims that in the *Treatise*, '[h]e talks with contempt of hypotheses; and insinuates that such of our countrymen as have banished them from moral philosophy, have done a more signal service to the world than my Lord Bacon'. I have been unable to find a place in the *Treatise* where he speaks with contempt of hypotheses in general. Rather, he rejects 'vulgar hypothesis',<sup>41</sup> rejects

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39 Hume, *Abstract* 1.

40 'Most of the philosophers of antiquity who treated of human nature have shown more of a delicacy of sentiment, a just sense of morals, or a greatness of soul, than a depth of reasoning and reflection. They content themselves with representing the common sense of mankind in the strongest lights, and with the best turn of thought and expression, without following out steadily a chain of propositions, or forming the several truths into a regular science'—Hume, *Abstract* 1.

41 Hume, *Treatise* 1.3.12.20.



premature acceptance of unexamined new hypotheses<sup>42</sup> and resists hypotheses that pretend ‘to discover the ultimate original qualities of human nature.’<sup>43</sup> By contrast, in the *Treatise*, there are at least ten instances in which he describes one of his own proposals as a ‘hypothesis’<sup>44</sup> or advocates the search ‘for some other hypothesis’.<sup>45</sup>

42 Ibidem 1.3.9.1.

43 Ibidem, Intro. 8. The rhetoric of rejecting hypotheses fits the second (and third) editions of Newton’s *Principia*, of course; the General Scholium (added to second edition of the *Principia*) famously rejected hypotheses in natural philosophy. Book III of the first edition of the *Principia* however started with a list of nine hypotheses.

44 E.g., ibidem, 1.3.9.10, where association of ideas is called ‘my hypothesis’.

45 Ibidem 1.4.2.17. See the useful index to the Nortons’ edition. One might think that Hume’s focus on experience and experiment means that he would categorically reject hypotheses. But prior to the second edition of the *Principia* (when Newton dropped his own hypotheses that he had listed at the start of Book III), it was quite common for experimental and empirical philosophers (say, Hooke, and Boyle) to introduce hypotheses. Only if one assumes that in the *Treatise* Hume must be following (the later) Newton can one read the appeal to experience as a rejection of hypotheses. But one of the points of this paper is precisely to contribute to the growing critical scrutiny of the once common identification of Hume’s experimental method with a Newtonian enterprise, even if the present argument is largely free-standing. (For a recent sophisticated defence of the old consensus view, see De Pierris G., “Hume and Locke on Scientific Methodology: The Newtonian Legacy”, *Hume Studies* 32, 2 (2006) 277–329.) For the critical literature see Casini P., “Newton’s *Principia* and the Philosophers of the Enlightenment”, *Notes and Records of the Royal Society of London* 42, 1 (1988) 35–52; Barfoot M., “Hume and The Culture of Science in The Early Eighteenth Century”, in Stewart M.A. (ed.), *Studies in the Philosophy of Scottish Enlightenment* (Oxford: 1990) 151–190; Waxman W., “The Psychologistic Foundations of Hume’s Critique of Mathematical Philosophy”, *Hume Studies* 22, 1 (1996) 123–168; Hazony Y., “Newtonian Explanatory Reduction and Hume’s ‘System of the Sciences,’” in Biener Z. – Schliesser E. (eds.), *Newton and Empiricism* (Oxford – New York: 2014); Hazony Y. – Schliesser E., “Newton and Hume”, in Russell P. (ed.), *The Oxford Companion to David Hume* (Oxford: in press); Demeter T., “Hume’s Experimental Method”, *British Journal for the History of Philosophy* 20 (2012) 577–599; Boehm M., “Hume’s Foundational Project in the *Treatise*”, *European Journal of Philosophy* (2013); Schliesser E., “Hume’s Attack on Newton”, *Enlightenment & Dissent* 25 (2009) 167–203; Schliesser E., “Two Definitions of Causation, Normativity, and Hume’s Debate with Newton”, in Ducheyne S. (ed.), *Future Perspectives on Newton Scholarship and the Newtonian Legacy in Eighteenth-century Science and Philosophy* (Brussels: 2009); Schliesser E., “Hume’s Missing Shade of Blue Reconsidered from a Newtonian Perspective”, *Journal of Scottish Philosophy*, 2, 2 (2004) 164–175; Schliesser E., “Hume’s Newtonianism and Anti-Newtonianism”, *The Stanford Encyclopedia of Philosophy* (Winter 2008 Edition), ed. E.N. Zalta, URL = <<http://plato.stanford.edu/archives/win2008/entries/hume-newton/>>.

Moreover, in the *Abstract* he suggests that by rejecting hypotheses in moral philosophy, the new English tradition he has identified has been even more useful to mankind than Bacon. I defy anybody to find anything remotely like this precise thought insinuated in the original *Treatise*. (Though in the introduction to the *Treatise*, Hume does of course claim that moral philosophy can be more useful than natural philosophy.) Yet, the *Abstract* emphasizes, '[h]e [the author of the *Treatise*] mentions, on this occasion' the five philosophers. Even if Hume was abstracting entirely from memory, this is a very creative reading of his own text. It is also a subtle lowering of status for Bacon.<sup>46</sup> To be clear, the lowering of what one might call the totemic value of Bacon is quite compatible with Hume's continued adherence to various Baconian positions (including explanatory reductionism, experimentalism, etc.).<sup>47</sup>

So, while Hume drops and changes aspects of the *Treatise's* Introduction, these changes are designed to highlight the originality and philanthropy ('a more signal service to the world') of the new English tradition of the science of man even more emphatically. I doubt Hutcheson or Butler viewed Mandeville in such a benign light. But Hume also adds to his description of the English tradition. I quote the passage which offers an explanation for these larger thematic shifts before commenting on it:

But 'tis at least worth while to try if the science of *man* will not admit of the same accuracy which several parts of natural philosophy are found susceptible of. There seems to be all the reason in the world to imagine that it may be carried to the greatest degree of exactness. If, in examining several phenomena, we find that they resolve themselves into one common principle, and can trace this principle into another, we shall at last arrive at those few simple principles on which all the rest depend. And tho' we can never arrive at the ultimate principles, 'tis a satisfaction to go as far as our faculties will allow us.

This seems to have been the aim of our late philosophers, and, among the rest, of this author. He proposes to anatomize human nature in a regular manner, and promises to draw no conclusions but where he is authorized by experience.<sup>48</sup>

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46 In "Of the Dignity or Meanness of Human Nature" (first published in 1741 as "Of The Dignity of Human Nature") Hume calls Bacon 'wise'—a characterization not removed in subsequent editions. I thank Katy Abramson for calling my attention to this.

47 I thank a referee for insisting on this clarification.

48 Hume, *Abstract* 1–2.

First, here Hume is far more specific about the methodology common to the English tradition. He claims that they are committed to what we might call explanatory reductionism based on empirical evidence.<sup>49</sup> And this explanatory reductionism becomes the main, overarching theme of the *Abstract*, which in the concluding paragraph emphasizes that ‘if any thing can entitle the author to so glorious name as that of an inventor, ’tis the use he makes of the principle of association of ideas, which enters into most of his philosophy’.<sup>50</sup> I suspect that except for Locke and Mandeville, perhaps, the English philosophers would have objected to the sceptical spin—viz., we can never arrive at the ultimate principles—which Hume gives to their shared explanatory model.

It is however also worth mentioning that the focus on explanatory reductionism makes the normative part of the *Treatise* a less natural outgrowth of the project. Recall that in *Treatise* 1.3.15, Hume states eight ‘rules by which to judge of causes and effects’ because it is ‘possible for all objects to become causes or effects to each other’. Hume thinks it is ‘proper’ to employ them in his ‘reasoning’.<sup>51</sup> Earlier in the *Treatise*, he was even more adamant about the regulative character of these rules:

We shall afterwards take notice of some general rules, by which we ought to regulate our judgment concerning causes and effects; and these rules are form’d on the nature of our understanding, and on our experience of its operations in the judgments we form concerning objects.<sup>52</sup>

Moreover, in the Introduction to the *Treatise*, Hume had written,

[...] even mathematics, natural philosophy, and natural religion, are in some measure dependent on the science of man [...]. ’Tis impossible to tell what changes and improvements we might make in these sciences were we thoroughly acquainted with the extent and force of human

49 See also Schliesser E., “Copernican revolutions revisited in Adam Smith by way of David Hume”, *Revista Empressa y Humanismo* 13 (2010) 213–248.

50 Hume, *Abstract* 35.

51 Hume, *Treatise* 1.3.15.2 and 1.3.15.11.

52 Ibidem 1.3.13.11. See Martin M.A., “The Rational Warrant for Hume’s General Rules”, *Journal of the History of Philosophy* 31, 2 (1993) 245–257; and de Pierris G., “Hume’s Pyrrhonian Skepticism and the belief in Causal Laws”, *Journal for the History of Philosophy* 39, 3 (2001) 351–383.

understanding, and cou'd explain the nature of the ideas we employ, and of the operations we perform in our reasoning.<sup>53</sup>

Hume thinks that armed with future knowledge of human nature, we may improve the other sciences. So, it should be no surprise that, in the *Introduction*, Hume also suggests that the study of human nature will change, at least in part, the total structure ('a compleat system') of the other sciences.<sup>54</sup> In his summary in the *Abstract*, Hume does not even mention a regulative function for the science of man; the science of man is also not named as the 'foundation' for the other sciences.<sup>55</sup>

Third, Hume now takes *successes* in *several parts* of natural philosophy as a model to be emulated by the science of man. This is never mentioned in and really not the point of the *Treatise's* Introduction, where the science of man will be in a position to regulate mathematics, natural philosophy, and natural religion. The idea is not entirely absent in *Treatise*, but it is not highlighted.<sup>56</sup>

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53 Hume, *Treatise* Introd. 4.

54 Hume's ambition to offer 'a compleat system' is worth contrasting with the claim by MacLaurin that 'a compleat system indeed was not to be expected from one man, or one age, or perhaps from the greatest number of ages; could we have expected it from the abilities of any one man, we surely should have had it from Sir *Isaac Newton*: but he saw too far into nature to attempt it' (MacLaurin, *Account* 96).

55 Cf., especially, Hume, *Treatise* Introd. 5–6.

56 'Besides, we find in the course of nature, that tho' the effects be many, the principles, from which they arise, are commonly but few and simple, and that 'tis the sign of an unskilful naturalist to have recourse to a different quality, in order to explain every different operation. How much more must this be true with regard to the human mind, which being so confin'd a subject may justly be thought incapable of containing such a monstrous heap of principles, as wou'd be necessary to excite the passions of pride and humility, were each distinct cause adapted to the passion by a distinct set of principles?

Here, therefore, moral philosophy is in the same condition as natural, with regard to astronomy before the time of *Copernicus*. The antients, tho' sensible of that maxim, *that nature does nothing in vain*, contriv'd such intricate systems of the heavens, as seem'd inconsistent with true philosophy, and gave place at last to something more simple and natural. To invent without scruple a new principle to every new phaenomenon, instead of adapting it to the old; to overload our hypotheses with a variety of this kind; are certain proofs, that none of these principles is the just one, and that we only desire, by a number of falsehoods, to cover our ignorance of the truth' (Hume, *Treatise* 2.1.3.6–7). For discussion see Manzo S., "David Hume and Copernicanism" presented at the Hume Society, Halifax, August 2009 and Schliesser, "Copernican Revolutions Revisited".

Finally, in the *Abstract* Hume is far more tentative about the degree of epistemic security that can be achieved by human sciences. Gone is the confidence that it 'will not be inferior in certainty';<sup>57</sup> now it is 'only worth while to try'.

The *Abstract* thus signals a series of subtle shifts within the system of the sciences. Some of these may be accounted for by changed genres (the shift from the Introduction to the *Abstract*). But the *Abstract* includes new elaborations and emphases, and this suggests something other than mere summary is going on. The most important differences—a) the shift to the Moderns, b) the increased tone of humility toward natural philosophy, c) the rejection of hypotheses, d) the reduced rhetoric about the normative project, e) the lowered status of Bacon, and f) even the insistence on explanatory reductionism—can be accounted for by an important change of historical circumstances; in particular, a dramatic change of status in Newton's authority in the 1730s.

When Hume drafted the *Treatise* while at La Flèche in 1734–1737, Newton's system was not a 'settled fact'—there were serious outstanding empirical issues (regarding the shape of the Earth and the lengthening of the pendulum with latitude). These doubts concerned the *empirical* adequacy of the universal law of gravitation (which emboldened those with metaphysical concerns). The issues were not decided until French expeditions to Lapland and the Equator were made.<sup>58</sup> Maupertuis's *Sur la figure de la terre* appeared in 1738 (and was also published in English translation that year). Adam Smith mentions this result as decisive evidence for Copernicanism and the Newtonian system in his "History of Astronomy".<sup>59</sup> In 1738, Voltaire also published an influential piece of Newtonian propaganda, his *Eléments de la philosophie de Newton*; an English translation again appeared in the same year. It is unclear when Hume became aware of the relevant empirical evidence, but probably not at La Flèche. It is, of course, possible that when back in Britain between the publication of the first two books of the *Treatise* and the drafting of the *Abstract* (and the *Appendix*, where he first came close to mentioning Newton explicitly; the *Appendix* was

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57 Hume, *Treatise* Introd. 10.

58 See Schliesser E. – Smith G.E., "Huygens' 1688 Report to the Directors of the Dutch East India Company on the Measurement of Longitude at Sea and the Evidence it Offered Against Universal Gravity", *Archive for the History of the Exact Sciences*, forthcoming, and Maglo K., "The Reception of Newton's Gravitational Theory by Huygens, Varignon, and Maupertuis: How Normal Science may be Revolutionary", *Perspectives on Science* 11, 2 (2003) 135–169.

59 Smith Adam, *Essays on Philosophical Subjects*, in idem, *The Glasgow Edition of the Works and Correspondence of Adam Smith*, ed. W.P.D. Wightman – J.C. Bryce (Indianapolis: 1982) vol. III, "The History of Astronomy".

added to the third book published in November 1740), he became aware of these recent developments.<sup>60</sup>

To be clear, when Hume drafted the first two volumes of the *Treatise*, continental Cartesians had accepted celestial inverse-square gravity, and it was accommodated within their various systems. But otherwise, outside Britain, Hume could have found himself in numerous and significant company in thinking that the terrestrial (and, thus, universal) gravity part of Newton's claims was still speculative.<sup>61</sup> That is to say, when, in the Introduction to the *Treatise*, Hume fashioned himself as heir to and innovator in an English tradition in the science of man, he did so in part to challenge the authority of mathematical natural philosophy.<sup>62</sup> In crafting this English tradition, he did not call attention to the continental (Descartes, Malebranche, Bayle, etc.) and anti-Newtonian (Berkeley, Leibniz) conceptual tools he would be relying on. After 1738, learned opinion moved decisively into Newton's camp across Europe, and thus Hume was faced with a rhetorical problem. Newton was now being lauded by progressive French thinkers, especially Voltaire.

I conjecture that many of Hume's changes between *Treatise* and abstract reflect the new-found authority of Newton.<sup>63</sup> Two of the five shifts identified seem directly tied to the new prestige of Newton: Hume's sudden dismissal of hypotheses in the *Abstract* echoes Newton's '*hypothesis non fingo*', and the stress on explanatory reductionism is typically Newtonian.<sup>64</sup> The three other

60 For an attempt to understand Books I and II of the *Treatise* as a unified project see Harris J., "A compleat chain of reasoning': Hume's project in *A Treatise of Human Nature*, Books 1 and 2", *Proceedings of the Aristotelian Society* 109 (2009) 129–148.

61 This was Locke's position to his death. See Domski M., "Locke's Qualified Embrace of Newton's *Principia*", in Janiak A. – Schliesser E. (eds.), *Interpreting Newton* (Cambridge: 2012) 48–68.

62 See especially Hume's very critical treatment of the application of geometry at Hume, *Treatise* 1.2.4.17–33 and also the extremely sceptical arguments about even mathematical knowledge at ibidem 1.4.1.1–6. On ibidem 1.4.1.1–6, see Meeker K., "Hume on Knowledge, Certainty, and Probability: Anticipating the Disintegration of the Analytic/Synthetic Divide?", *Pacific Philosophical Quarterly* 88 (2007) 226–242. Presumably the purpose behind Hume's strategy was to challenge Newtonian cosmogony which focused on design arguments.

63 This is not to say the *Abstract* lands all the blows in Hume's critical attitude toward mathematical natural philosophy in *Treatise* 1.2. He belatedly (and out of order) mentions some of the crucial doctrines in part 2 book 1 (Hume, *Abstract* 29).

64 My treatment is not very fine-grained. In particular, there is a growing literature relating Newton's methodological distinction between analysis and synthesis to Hume's explanatory reductionism. Thus the 'elements' of Hume's system (Hume, *Treatise* 1.1.4.7) are both taken for granted to explore other phenomena (synthesis) as well as deduced

shifts can also be understood in this context: the new, normative *modesty* toward mathematical natural philosophy seems tied to the new-found prestige of the latter. Furthermore, post-Newton the debate between Ancients and Moderns became increasingly one sided;<sup>65</sup> the Ancients had nothing to match recent successes in natural philosophy. The modern notion of progress was about to be born. Finally, within English natural philosophy Newtonian mathematical natural philosophy was seen as displacing Baconian natural history.<sup>66</sup> My speculative argument here fits with the evidence collected by Martin Bell, who has explored how Hume adopts far more Newtonian rhetoric in the first *Enquiry*.<sup>67</sup> In his later works, Hume never again challenges the epistemic status of the *application* of mathematics as such in physical enquiry in general,<sup>68</sup> but he certainly continues to suggest that Newtonian (religious) cosmogony is useless and he does not flinch from suggesting that mathematics can be a source of scepticism *tout court*.<sup>69</sup>

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from the phenomena in Hume. See Thomas Sturm's contribution to this volume as well as Hazony Y., "Newtonian Explanatory Reduction and Hume's 'System of the Sciences'", in Biener Z. – Schliesser E. (eds.), *Newton and Empiricism* (Oxford: 2014).

- 65 This does not mean Hume cannot find ways to balance the scales: 'it may be observed, that even this later period of human learning is, in many respects, of an opposite character to the ancient; and that, if we be superior in *philosophy*, we are still, notwithstanding all our refinements, much inferior in eloquence'.—Hume David, *Essays Moral, Political, Literary*, ed. E.F. Miller, rev. ed. (Indianapolis: 1987) 89.
- 66 See Feingold M., "Mathematicians and Naturalists: Sir Isaac Newton and the Royal Society", in Buchwald J. Z. – Cohen I.B. (eds.), *Isaac Newton's Natural Philosophy* (Cambridge: 2000).
- 67 Bell M., "Hume and Causal Power: The Influence of Malebranche and Newton", *British Journal for the History of Philosophy* 5, 1 (1997) 67–86. One otherwise sympathetic referee has rightly noted that Hume's *Enquiries* play an insignificant role in my argument. This is a lacuna, especially because one of the sub-texts of this paper is to motivate a different understanding of Hume's relationship to the sciences than is commonly accepted in the scholarly literature (and if that were the main focus of this paper, it would indeed require careful consideration of the *Enquiries*). But while Hume makes tantalizing comments about the status of various authors throughout both *Enquiries*, I have been unable to discern Hume's use of literary-intellectual traditions of the sort that I am analyzing in the body of this paper.
- 68 Hume David, *An Enquiry Concerning Human Understanding*, ed. T.L. Beauchamp (Oxford: 2006) 12.27, SBN 163.
- 69 Cf. Hume, *Enquiry* 12.20, SBN 157–158. See Hume's 'new microscope', which is restricted to 'the moral sciences' in the first *Enquiry* (7.1.4). See also Schliesser E., "Four Methods of Empirical Enquiry in the Aftermath of Newton's Challenge", forthcoming.



### The History: A New Road

Here I conclude by showing how Hume constructs a different tradition leading up to himself in the *History*. The recasting of tradition in the *History* is, I conjecture, a further response to the success of Newton.

The invented tradition that leads up to Hume in the *History* that I am about to describe does not receive the same kind of prominence as the one in the opening lines of the *Treatise* and the *Abstract*. In fact, Hume seems to go out of the way to make it hard to discern, and if it were not for the repetition of some striking locutions one might miss it altogether.

The main point of the passages that I am about to discuss is a movement from so-called ‘false’ to ‘true’ philosophy. The first extended use of this trope by Hume is in the *Treatise* at 1.4.3.9 (of the ancient philosophy), where he describes the relationship between vulgar, false, and true philosophy.<sup>70</sup> It may, perhaps, be echoed in the prominently introduced treatment of his ‘true metaphysics’ in the first *Enquiry*.<sup>71</sup>

But for the present purposes, two alternative passages are more important. First, I focus on a crucial passage from Hume’s posthumously published “Of Suicide”:

But superstition, being founded on false opinion, must immediately vanish, when *true philosophy* has inspired juster sentiments of superior powers. The contest is here more equal between the distemper and the medicine: And nothing can hinder the latter from proving effectual, but its being false and sophisticated.<sup>72</sup>

True philosophy can be a medicine against superstition.<sup>73</sup> As is well known, this piece was originally intended for publication in 1755. I mention it because

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70 The best treatment of this is to be found in Livingston D.W., *Philosophical Melancholy and Delirium: Hume’s Pathology of Philosophy* (Chicago: 1998) especially chapter 2, “The Dialectic of True and False Philosophy”. (See also Hume, *Treatise* 2.1.4.7, quoted above; 3.2.10.15; 3.3.1.10.) See also Schliesser E., “Philosophic Prophecy”, in M. Laerke et al., *Philosophy and its History* (Oxford: 2013).

71 Hume, *Enquiry* 1.12.

72 Hume, *Essays* 579.

73 This suggests that Harris J., “Hume’s four essays on Happiness and their Place in the Move from Morals to Politics”, in Mazza E. – Ronchetti E. (eds.), *New Essays on David Hume* (Milan: 2007) cannot be entirely right. Harris explores how the four essays (The Epicurean, The Stoic, The Platonist, The Sceptic) contribute to ‘one’s understanding of Hume’s conceptions of the task of moral philosophy’ (226). Taken together, these essays



it shows that from Hume often used a distinction (not necessarily identical in meaning) between true and false philosophy.

Second, very early in the *Treatise*, immediately after Hume has given us an introduction to the associative mechanism (the principle that according to the *Abstract* gives to the 'author [...] so glorious name as that of an inventor'), Hume provides us with a clue to the content of his response to Newton:

These are therefore the principles of union or cohesion among our simple ideas, and in the imagination supply the place of that inseparable connexion, by which they are united in our memory. Here is a kind of ATTRACTION, which in the mental world will be found to have as extraordinary effects as in the natural, and to shew itself in as many and as various forms. Its effects are every where conspicuous; but as to its causes, they are mostly unknown, and must be resolved into original qualities of human nature, which I pretend not to explain. Nothing is more requisite for a true philosopher, than to restrain the intemperate desire of searching into causes, and having established any doctrine upon a sufficient number of experiments, rest contented with that, when he sees a farther examination would lead him into obscure and uncertain speculations. In that case his enquiry would be much better employed in examining the effects than the causes of his principle.<sup>74</sup>

Hume's associative principle is a kind of mental attraction evidentially on par with the physical kind.<sup>75</sup> It provides, as Hume claims in the *Abstract*, explanatory reductionism. The *Treatise* also gives a sceptical slant to it—its causes must be unaccountably located in the 'original qualities of human nature'.

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present, 'the bankruptcy of the ancient conception of moral philosophy as a means of curing the soul with reasoned argumentation about the nature of the highest good for human beings' (230). According to Harris, Hume accepts the Hobbesian program that philosophy cannot be 'medicine of the soul' (234). But the passage from 'Of Suicide' suggests otherwise (see also "Of Superstition and Enthusiasm": 'As superstition is a considerable ingredient in almost all religions, even the most fanatical; there being nothing but *philosophy* able entirely to conquer these unaccountable terrors'—Hume, *Essays* 75). Of course, even if Hume disagrees with Hobbes's negative assessment, it entirely allows that Hume agrees with Hobbes that philosophy is a medicine for the state (and this is indirectly confirmed by Hume, *Treatise* 3.2.10.15; 3.3.1.10, and the treatment of 'false philosophy' in "Of the Original Contract").

74 Hume, *Treatise* 1.1.4.6.

75 Hume sticks with this claim (see "Of the Balance of Trade" and "Dissertation of the Passions").

Crucially, Hume identifies the ‘true philosopher’ with the person who knows how to stop further enquiry. Putting an end to enquiry into causes avoids getting one involved in the wrong (obscure and uncertain) kind of enterprise—the sort that only leads to *useless* speculations. While on the surface Hume’s argument is very akin to Newton’s ‘*hypotheses non fingo*’,<sup>76</sup> Newton did not think one ought to end inquiry. Rather he hoped that ‘the principles set down here will shed some light on either this mode of philosophizing *or some truer one*’.<sup>77</sup> So, while not denying that Hume is advocating further research on the effects of a known principle, the Humean ‘true philosopher’ of the *Treatise* respects certain kinds of self-imposed limits to inquiry. The criterion seems to be provided by the degree to which we are led to objects of pure speculation (which are not socially useful), which apparently follows from inquiry that may not have determinate result.

Let us turn to the *History*. Hume writes:

England itself, though sunk in the deepest abyss of ignorance and superstition, had seriously entertained thoughts of shaking off the papal yoke; and the Roman pontiff was obliged to think of new expedients for rivetting it faster upon the Christian world. For this purpose, Gregory IX. published his decretals, which are a collection of forgeries, favourable to the court of Rome, and consist of the supposed decrees of popes in the first centuries. But these forgeries are so gross, and confound so palpably all language, history, chronology, and antiquities; matters more stubborn than any speculative truths whatsoever; that even that church, which is not startled at the most monstrous contradictions and absurdities, has been obliged to abandon them to the critics. But in the dark period of the thirteenth century, they passed for undisputed and authentic; and men, entangled in the mazes of this false literature, joined to the philosophy, equally false, of the times, had nothing wherewithal to defend themselves, but some small remains of common sense, which passed for profaneness and impiety, and the indelible regard to self-interest, which,

76 Cf. McMullin E., “The Impact of Newton’s Principia on the Philosophy of Science”, *Philosophy of Science* 68, 3 (2001) 279–310.; with Schliesser E., “Newton’s Challenge to Philosophy: A Programmatic Essay”, *HOPOS: The Journal of the International Society for the History of Philosophy of Science* 1 (2011) 101–128.

77 Newton Isaac, *Philosophiae Naturalis Principia Mathematica* (London, S. Pepys: 1686) Author’s Introduction, emphasis added; see also Newton’s fourth rule of reasoning.

as it was the sole motive in the priests for framing these impostures, served also, in some degree, to protect the laity against them.<sup>78</sup>

For Hume the 'dark' ages are full 'ignorance and superstition', which are marked by a 'false' philosophy and 'false literature'.<sup>79</sup> While there is much more in this passage that might interest us, this is a nice description of Hume's typical (and, perhaps, unfair) Enlightenment view of the ground zero (here the thirteenth century) from which progress, however slowly, can be made. But it has to be admitted that Hume does not flag the theme here. Now fast forward to the sixteenth century; in this connection, Hume writes:

The quick and surprising progress of this bold sect may justly in part be ascribed to the late invention of printing, and revival of learning: Not that reason bore any considerable share, in opening men's eyes with regard to the impostures of the Romish Church: For of all branches of literature, *philosophy* had, as yet, and till long afterwards, made the most inconsiderable progress; neither is there any instance that argument has ever been able to free the people from that enormous load of absurdity, with which superstition has every where overwhelmed them [...]. The minds of men, somewhat awakened from a profound sleep of so many centuries, were prepared for every novelty, and scrupled less to tread in any unusual path, which was opened to them.<sup>80</sup>

78 Hume, *History* vol. II, 70–71.

79 This is not to deny that for Hume outstanding minds can shine forth even in very darkest periods, for example Alfred the Great (see Hume, *History* vol. I, 74–75; and, in later times, Sir William Temple and Johan de Wit (see *ibidem* vol. VI, 219–220). Harvey is marked out for special recognition by Hume. This has made Wertz claim that Harvey is Hume's model character in Wertz S.K., "Hume and the Historiography of Science", *Journal of the History of Ideas* 54, 3 (1993) 411–436. But while according to Hume 'Harvey is entitled to the glory of having made, by reasoning alone, without any mixture of accident, a capital discovery in one of the most important branches of science' and is praised for 'his industry and ingenuity', he is not fitted into the narrative of the slow progress of true philosophy. Rather he is used to reinforce another Humean idea; that habits of thought are slow to change: 'It was remarked, that no physician in Europe, who had reached forty years of age, ever, to the end of his life, adopted *Harvey's* doctrine of the circulation of the blood, and that his practice in London diminished extremely, from the reproach drawn upon him, by that great and signal discovery. So slow is the progress of truth in every science, even when not opposed by factious or superstitious prejudices!' Hume, *History* vol. VI, 153–154.

80 Hume, *History* vol. III, 140. One wonders if Kant's awakening from dogmatic slumber by Hume is not meant to be a further tribute to Hume's language here. Hume's *History* had been translated in German, and was familiar to Kant, who discusses the *History* in his

For our purposes, it is significant that Hume uses the sixteenth-century Reformation to introduce his readers to the theme of the varieties of the very possibility of intellectual progress and the social ingredients (i.e. new technologies) that enter into it. Rather than attributing to Protestantism itself virtues that make the scientific revolution possible (cf. Weber and Merton), Hume sees a more secondary effect: 'awakened' minds are open to novelty. After centuries of superstition the forces of light enter the scene.<sup>81</sup> But the progress of philosophy is exceedingly slow; even as late as James VI and I and Bacon the times were very marked by superstition:

It may be worth observing, that James, from his great desire to promote controversial divinity, erected a college at Chelsea for the entertainment of twenty persons, who should be entirely employed in refuting the papists and puritans. All the efforts of the great Bacon could not procure an establishment for the cultivation of natural *philosophy*: Even to this day, no society has been instituted for the polishing and fixing of our language. The only encouragement, which the sovereign in England has ever given to any thing, that has the appearance of science, was this short-lived establishment of James; an institution quite superfluous, considering the unhappy propension, which, at that time, so universally possessed the nation for polemical theology.<sup>82</sup>

Now with the Introduction to the *Treatise* in mind, one might not be surprised that Bacon is called 'great'. Yet, it might be thought to undermine my argument that from the Abstract onward, Hume downplays Bacon's significance. To forestall this possible objection, I quote Hume's summary of Bacon's life nearly in full:

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1775–1776 lectures. See Sturm T., *Kant und die Wissenschaften vom Menschen* (Paderborn: 2009) chapter vi.

81 To do full justice to these themes, I would also have to describe Hume's treatment of 'barbarism' and civilization (see Pocock J.G.A., *Barbarism and Religion* (Cambridge: 2001)) and his understanding of 'true liberty'. See further Schliesser E., "The Posidonian Argument and the Neutrality Requirement in Hume and Adam Smith", under review.

82 Hume, *History* vol. v, 132. In fact *Newton's* time continues to be marked by superstition: '[King James I] has composed a commentary on the Revelations, and proved the pope to be Antichrist; may not a similar reproach be extended to the famous writer Napier; and even to Newton, at a time when learning was much more advanced than during the reign of James? From the grossness of its superstitions, we may infer the ignorance of an age; but never should pronounce concerning the folly of an individual, from his admitting popular errors, consecrated by the appearance of religion' (ibidem).

The great glory of literature in this island, during the reign of James, was lord Bacon [...]. If we consider the variety of talents displayed by this man; as a public speaker, a man of business, a wit, a courtier, a companion, an author, a philosopher; he is justly the object of great admiration. If we consider him merely as an author and philosopher, the light in which we view him at present, though very estimable, *he was yet inferior to his cotemporary Galileo, perhaps even to Kepler. Bacon pointed out at a distance the road to true philosophy*: Galileo both pointed it out to others, and made himself considerable advances in it. The Englishman was ignorant of geometry: The Florentine revived that science, excelled in it, and was the first that applied it, together with experiment, to natural philosophy. The former rejected, with the most positive disdain, the system of Copernicus: The latter fortified it with new proofs, derived both from reason and the senses. Bacon's style is stiff and rigid: His wit, though often brilliant, is also often unnatural and far-fetched; and he seems to be the original of those pointed similes and long-spun allegories, which so much distinguish the English authors: Galileo is a lively and agreeable, though somewhat a prolix writer. But Italy, not united in any single government, and perhaps satiated with that literary glory, which it has possessed both in ancient and modern times, has too much neglected the renown which it has acquired by giving birth to so great a man. That national spirit, which prevails among the English, and which forms their great happiness, is the cause why they bestow on all their eminent writers, and on Bacon among the rest, such praises and acclamations, as may often appear partial and excessive.<sup>83</sup>

First, he continues to admire Bacon, but Hume clearly does not portray Bacon as the re-founder of the sciences or a particularly important philosopher. In fact, if anything, he comes very close to claiming that the praise for Bacon has its roots in *English* nationalism. Given that Scotland is nearly entirely excluded from the *History*, in this context we might be inclined to read 'the English' as referring more narrowly than in the *Treatise*. If anything, he suggests that literary fame can be a consequence of the vicissitudes of national unity.<sup>84</sup> Hume's perspective here is quite European: he calls attention to the contributions

83 Ibidem.

84 Hume's treatment of Hobbes in the *History* ('in our time, he is much neglected: A lively instance how precarious all reputations, founded on reasoning and philosophy!') and his treatment of Locke (who will be 'entirely forgotten' when people may still be reading Addison (first *Enquiry*)), suggests that posthumous fame of the philosopher is never

of Copernicus, Kepler, and Galileo. We are far removed from the national narrative of the Introduction to the *Treatise* (and even the *Abstract*). In fact, as we shall see, Hume's language in his new description echoes more closely the kind of rhetoric I quoted earlier from Voltaire and Barbeyrac.

Second, Hume's narrative of the progress of philosophy finally starts to gather speed. Bacon's role in generating this progress is much reduced: he 'pointed out at a distance the road to true philosophy'. Bacon is not a true philosopher; he never even made it on the road to true philosophy. Bacon is a sign-post for things to come; that is all. While the description of Kepler is terse, Hume seems to imply that Kepler made it on the road to true philosophy. But the new hero of the narrative is Galileo, who not only spread the good news, but made 'considerable advances' toward 'true philosophy'.<sup>85</sup> If we leave aside Galileo's writing style, Hume commends him for his great skill in geometry and, in particular, its application together with experiment in natural philosophy. Galileo has found the nearly ideal combination of reason and empirical evidence. But Galileo is not labelled as a 'true philosopher'; he has only made considerable advances on the road.<sup>86</sup> So, the question arises, does Galileo's shortcoming arise in a point of methodology or doctrine (or both), or something altogether different? At least the outline of an answer to these questions can be discerned in Hume's treatment of Boyle and Newton:

But though the French academy of sciences was directed, encouraged and supported by the sovereign, there arose in England some men of superior genius who were more than sufficient to cast the balance, and who drew on themselves and on their native country the regard and attention of Europe. Besides Wilkins, Wren, Wallis, eminent mathematicians, Hooke, an accurate observer by microscopes, and Sydenham, the restorer of *true* physic; there flourished during this period a Boyle and a Newton; men

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far removed from his thoughts. See also Schliesser, "Obituary" and Baier A.C., *Death and Character: Further Reflections on Hume* (Cambridge: 2008).

85 This is not the first time Hume had praised Galileo so highly: 'Were we to distinguish the Ranks of Men by the Genius and Capacity more than by their Virtue and Usefulness to the Public, great Philosophers would certainly challenge the first Rank, and must be plac'd at the Top of human Kind. So rare is this Character, that, perhaps, there has not, as yet, been above two in the World, who can lay a just Claim to it. At least, Galileo and Newton seem to me so far to excel all the rest'—Hume David, *Essays, Moral, Political, and Literary*, ed. E.F. Miller (Indianapolis: 1987) 550. From the point of view of utility, Galileo and Newton shine less brightly.

86 In Voltaire, Galileo was called 'great' (*Letter XIV*).

who trod, with cautious, and therefore the more secure steps, the only road, which leads to true philosophy.<sup>87</sup>

So, despite the more favourable French institutional setting, England produced eminent men in the seventeenth century. In contrast to the Introduction to the *Treatise*, Hume drops the claim that English pre-eminence is a necessary consequence of toleration and liberty. This view he came to attribute to Addison and Shaftesbury and repudiate in his essay "Of Civil Liberty".<sup>88</sup> Echoing Mandeville, Sydenham, the teacher of Locke, is singled out for praise as the restorer of true medicine. Boyle and Newton receive high praise. In fact, the list of names in this paragraph overlaps with Locke's oft-quoted line from the 'Epistle to the Reader' of the *Essay*:

[...] every one must not hope to be a Boyle or a Sydenham; and in an age that produces such masters as the great Huygenius and the incomparable Mr. Newton, with some others of that strain, it is ambition enough to be employed as an under-labourer in clearing the ground a little, and removing some of the rubbish that lies in the way to knowledge.<sup>89</sup>

Lest we think this overlap suggests Hume is returning to his Lockean roots, *Locke* is pointedly excluded by Hume from his list. Not only does Locke fail to receive his own mini-biography of the sort Hume gives to Bacon (quoted above) and Hobbes (partially quoted above), he only gets mentioned twice in the whole *History*. In both cases Hume criticizes him: once to deny his veracity as a historical witness<sup>90</sup> and once to treat him as a footnote exemplar of Whig

87 Hume, *History* vol. VI, 541.

88 'But what would these writers have said, to the instances of modern ROME and of FLORENCE? Of which the former carried to perfection all the finer arts of sculpture, painting, and music, as well as poetry, though it groaned under tyranny, and under the tyranny of priests: While the latter made its chief progress in the arts and sciences, after it began to lose its liberty by the usurpation of the family of MEDICI. ARIOSTO, TASSO, GALILEO, more than RAPHAEL, and MICHAEL ANGELO, were not born in republics [...]. And though the LOMBARD school was famous as well as the ROMAN, yet the VENETIANS have had the smallest share in its honours, and seem rather inferior to the other ITALIANS, in their genius for the arts and sciences. RUBENS established his school at ANTWERP, not at AMSTERDAM: DRESDEN, not HAMBURGH, is the centre of politeness in GERMANY'—Hume, *Essays* 90.

89 For a reading of Locke's intent, see Domski, "Locke's Qualified Embrace of Newton's *Principia*".

90 'The story told of Sir Anthony Ashley Cooper, by Mr. *Locke*, has not any appearance of truth. See lord Lansdown's Vindication, and Philips's Continuation of Baker. I shall add



propagandist.<sup>91</sup> So, whatever else we may think, according to Hume Locke is lost in the proverbial wilderness without a road in sight. Hume's distancing from Locke is a dramatic shift from the *Treatise*, *Abstract*, and the early editions of first *Enquiry*.<sup>92</sup>

Boyle and Newton receive praise for their caution. This suggests that 'true philosophy' picks out a shared methodology and not content. In the mini-biography of Boyle, Hume does indeed emphasize his methodological aspects:

Boyle improved the pneumatic engine invented by Otto Guericke, and was thereby enabled to make several new and curious experiments on the air as well as on other bodies: His chemistry is much admired by those who are acquainted with that art: His hydrostatics contain a greater mixture of reasoning and invention with experiment than any other of his works; but his reasoning is still remote from that boldness and temerity, which had led astray so many philosophers. Boyle was a great partizan of the mechanical philosophy; a theory, which, by discovering some of the secrets of nature, and allowing us to imagine the rest, is so agreeable to the natural vanity and curiosity of men. He died in 1691, aged 65.<sup>93</sup>

Boyle's experimental practice and reasoning style are praised; Boyle is a creative experimentalist, but cautious in his arguments. By contrast, Boyle's theory, the mechanical philosophy, only gets limited endorsement. For Newton 'falsifies' the mechanical philosophy:

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to what those authors have advanced, that cardinal Mazarine wished for the king's restoration; though he would not have ventured much to have procured it'—Hume, *History* vol. VI, 548 (NOTE [E], belonging to p. 134).

91 'The Whig party, for a course of near seventy years, has, almost without interruption, enjoyed the whole authority of government; and no honours or offices could be obtained but by their countenance and protection. But this event, which, in some particulars, has been advantageous to the state, has proved destructive to the truth of history, and has established many gross falsehoods, which it is unaccountable how any civilized nation could have embraced with regard to its domestic occurrences. Compositions the most despicable, both for style and matter, have been extolled, and propagated, and read; as if they had equalled the most celebrated remains of antiquity.' Hume's footnote here reads: 'Such as Rapin Thoyras, Locke, Sidney, Hoadley, & [...]'—Hume, *History* vol. VI. 533. Part of the short shrift given Locke must be due to the period covered by Hume in the *History*.

92 Winkler, *Matters of Reason* is pioneering in this respect.

93 Hume, *History* vol. VI, 541.



In Newton this island may boast of having produced the greatest and rarest genius that ever arose for the ornament and instruction of the species. Cautious in admitting no principles but such as were founded on experiment; but resolute to adopt every such principle, however new or unusual [...]. While Newton seemed to draw off the veil from some of the mysteries of nature, he shewed at the same time the imperfections of the mechanical philosopher; and thereby restored her ultimate secrets to that obscurity, in which they ever did and ever will remain.<sup>94</sup>

Hume calls attention to three important methodological elements in Newton's natural philosophy: (a) Newton's commitment to an experimental method; (b) the cautious nature of Newton's methodology; (c) Newton's boldness once experiments have established a 'principle'. Hume equates Newton's methodology with Boyle's only on points (a) and (b), not point (c). So, Hume admires Newton's methodology, and sees it as a source of progress (although he somehow never mentions Newton's use of mathematics).<sup>95</sup> So, is the road to true philosophy merely methodological? This cannot be gleaned with certainty from these passages because while Boyle and Newton are definitely to be said on the road to true philosophy, Hume does not claim they have reached a final destination. (Newton only unveiled 'some of the mysteries', not all.) In particular, it is striking that in the last passage Hume does not praise Newton's doctrines at all. Rather, he turns Newton's achievement into something sceptical: on Hume's account Newton has shown the limits of knowledge.<sup>96</sup>

One may reasonably think that because the *History* ends in 1688, the open-ended character of the march along the road to true philosophy is an artefact of the temporal organization of the book.<sup>97</sup> But a more intriguing speculation is that Hume thinks *his* is the 'true philosophy' that understands the limits of knowledge. If this is so, then despite the dramatically changing narratives about how great men of the past pave the way to Hume and the changing evaluation of Bacon's and Newton's merits, Hume's philosophical views did not change very much throughout his career. While Hume dropped talk of the regulative character of the science of man, his scepticism is still offered from its perspective. In the *History*, Hume never tells us if he thinks the road to true philosophy can ever be completed.

94 Ibidem.

95 De Pierris, "Hume and Locke on Scientific Methodology" 320.

96 On the curious status of the mechanical philosophy in Hume's thought see Schliesser, "Hume's Attack on Newton".

97 Several readers have suggested this.

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## *Ethics in Epistemology*





# Francis Bacon on Charity and the Ends of Knowledge

*Sorana Corneanu*

## Summary

The notion that charity should govern the pursuit, growth, and use of knowledge is a persistent core ingredient of Francis Bacon's presentations of his programme for the reformation of learning, from his early to his late writings. Baconian charity is generally interpreted in either utilitarian or philanthropic terms and is thus associated with the outcomes (the end-products) of the pursuit of knowledge, seen as contributions to human welfare. The aim of this paper is to show that Baconian charity has a richer compass and that it governs a notion of the fruitfulness of knowledge, which includes several types of 'fruit' or 'benefit'. They are represented not only by the welfare produced, but also by the fruitfulness of natural inquiry itself, as well as the fruitfulness of the transmission of natural knowledge. These latter types of fruit rest on a number of virtues of inquiry directed towards what Bacon calls the 'marriage' of mind and things; these virtues are the epistemic and methodological counterparts of moral-religious virtues, which, according to Bacon, constitute the inner fruits of charity.

## Introduction

Throughout his writings, in introducing his programme for the reformation of natural philosophy, Francis Bacon insisted that legitimate knowledge of nature is to be pursued with the end of offering 'benefit', 'use', and 'relief' to mankind. Indeed, it is the pursuit of this end that offers legitimacy to natural knowledge in the first place. From the early *Valerius Terminus* of 1603 (knowledge 'must be subject to that use for which God hath granted it; which is the benefit and relief of the state and society of man; for otherwise all knowledge becomes malign and serpentine'),<sup>1</sup> to the Preface of the *Instauratio magna* of 1620 (knowledge

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<sup>1</sup> Bacon Francis, *Valerius Terminus*, in idem, *The Works of Francis Bacon*, eds. J. Spedding – R.L. Ellis – D.D. Heath, 14 vols. (Stuttgart, Bad Cannstatt: 1963–1994 [1857–1874]) (hereafter abbreviated as SEH followed by volume number) vol. III, 221–222.

should be sought ‘for the benefit and use of life’ and should ‘be perfected and regulated in charity’),<sup>2</sup> Bacon never tired of reminding his readers that the true end of knowledge is benefit and use as governed by charity. But what Bacon understood by ‘benefit and use’ and what role he assigned to charity in his programme are questions that still deserve investigation.

The strictly utilitarian reading that makes Bacon’s programme into a technological, industrial manifesto animated by humanitarian (or less humanitarian) purposes—a reading with roots in nineteenth-century utilitarianism—has by now become quite implausible. This is because it neglects at least two major factors: one is the cultural values of the context in which Bacon lived, while the other is a specific historical understanding of ‘use’ as an ingredient in the production of knowledge. Recent scholarship has made us alive to both these factors. On the one hand, Bacon shared with his time not a nineteenth-century utilitarian ideal, but a late Renaissance philanthropic concern with public welfare, fed by the humanist tradition of the active life devoted to civic good and by the Christian tradition of charity.<sup>3</sup> On the other, his reiterated statements that truth and utility, knowledge and power, theory and practice are facets of each other are to be understood to mean not simply that the latter terms of the pairs are results of the former, but also that utility, power, and practice are critical in the very production of truth, knowledge, and theory.<sup>4</sup>

2 Bacon Francis, *The Oxford Francis Bacon*, gen. eds. G. Rees – L. Jardine – B. Vickers (Oxford: 1996–) (hereafter abbreviated as OFB followed by volume number) vol. x1, 23 (ed. G. Rees with M. Wakeley).

3 See Vickers B., “Bacon’s So-Called Utilitarianism: Sources and Influences”, in Fattori M. (ed.), *Francis Bacon: Terminologia e Fortuna nel XVII secolo* (Rome: 1984) 281–314; Watanabe M., “Francis Bacon: Philanthropy and the Instauration of Learning”, *Annals of Science* 49 (1992) 163–173; Matthews S., *Theology and Science in the Thought of Francis Bacon* (Aldershot: 2008) 96–97. Several scholars see a tension between Bacon the philanthropic natural philosopher and the Machiavellian or Tacitean civic philosopher, e.g., Box I., “Bacon’s Moral Philosophy”, in Peltonen M. (ed.), *The Cambridge Companion to Bacon* (Cambridge: 1996) 260–282, here 274–276; Briggs J.C., “Bacon’s Science and Religion”, in Peltonen M. (ed.), *The Cambridge Companion to Bacon* 172–199, here 182–183. An interpretation of Baconian charity as instrumental towards a Machiavellian pursuit of fame can be found in Paterson T., “The Secular Control of Scientific Power in the Political Philosophy of Francis Bacon”, *Polity* 21 (1989) 457–480. Paterson has an entirely politicized reading that disregards the moral-philosophical and theological dimensions of Baconian charity. The latter dimensions are well captured in Prior M.E., “Bacon’s Man of Science”, in Vickers B. (ed.), *Essential Articles for the Study of Francis Bacon* (London: 1972) 140–163; see also McKnight S.A., *The Religious Foundations of Francis Bacon’s Thought* (Columbia: 2006).

4 See Rossi P., *Philosophy, Technology, and the Arts in the Early Modern Era*, trans. S. Atanasio, ed. B. Nelson (New York: 1970) 146–173; idem, “Bacon’s Idea of Science”, in Peltonen M. (ed.),

These are welcome corrections that have helped us understand Baconian ‘utility’ in a more historically nuanced and philosophically precise way. As far as charity is concerned, though, Bacon’s version of this virtue is placed against the background of what historians reconstruct as a long-term early modern shift whereby, following both Reformation and Counter-Reformation trends, what had once been a theological (infused) virtue of the will (as theorized, for instance, by Thomas Aquinas) came to be understood as an act of (or a programme or institution devoted to) public utility: charity became philanthropy in the modern sense of the term. Critical in this shift, we are told, was a change in the meaning of the term ‘charity’, from virtue of the will (understood as an inner disposition issuing in exterior acts) to action in social space (independent of any inner disposition). Historians of moral and religious thought propose that this change rested, on the one hand, on a difference in types of charitable sociability (from personal relationships to general and abstract benevolence) and on the other, on a difference in types of moral theory (from virtue ethics to the Christian ethics of duty and subsequently the ethics of rights and duties associated with natural law theories).<sup>5</sup> From this point of view, then, there is a utilitarian (i.e., social benefit-producing) aspect that is seen as defining for the new notion of charity, when compared with the older virtue notion.<sup>6</sup> Baconian charity has been interpreted as an unproblematic illustration of this general trend.<sup>7</sup> While the specific context of reflection on charity and the theological virtues that is relevant to Bacon’s thought is in need of more detailed

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*The Cambridge Companion to Bacon* 25–46; Pérez-Ramos A., *Francis Bacon’s Idea of Science and the Maker’s Knowledge Tradition* (Oxford: 1988); idem, “Bacon’s Forms and the Maker’s Knowledge Tradition”, in Peltonen M. (ed.), *The Cambridge Companion to Bacon* 99–120. Welcome clarifications of the types of operative mechanics at work in the Baconian inquisition of nature are to be found in Weeks S., “The Role of Mechanics in Francis Bacon’s *Great Instauration*”, in Zittel C. – Engel G. – Nanni R. – Karafyllis N.C. (eds.), *Philosophies of Technology: Francis Bacon and his Contemporaries*, 2 vols (Leiden: 2008) vol II, 133–195.

- 5 For this theme from the perspective of the social history of religion, see Bossy J., *Christianity in the West 1400–1700* (Oxford: 1985) 140–152; from the perspective of the history of moral thought, Schneewind J.B., “The Misfortunes of Virtue”, *Ethics* 101 (1990) 42–63.
- 6 A charitable, philanthropic programme is ‘utilitarian’ in this general sense, which should not be confused with the specific philosophy of (nineteenth-century) utilitarianism. I owe this observation to Peter Harrison.
- 7 E.g., most recently, in Harrison P., “Francis Bacon, Natural Philosophy, and the Cultivation of the Mind”, *Perspectives on Science* 20 (2012) 139–158; Lancaster J., “Natural Knowledge as a Propaedeutic to Self-Betterment: Francis Bacon and the Transformation of Natural History”, *Early Science and Medicine* 17 (2012) 181–196.

historical reconstruction,<sup>8</sup> my aim in this paper is to challenge this interpretation of Baconian charity by means of a reading of his own texts. I would like to propose that Bacon's notion of charity is, like much else in his thought, an idiosyncratic notion, one that combines traditional elements and refashions them for new purposes. The refashioning in question preserves for charity the status of an inner virtue, although one defined differently than in the traditional account; and it involves a new role for this virtue, that of governing a rich conception of the fruitfulness of natural philosophical knowledge.

The utilitarian aspect of charity (even when understood in philanthropic terms) refers to the end-products of what Bacon calls operative knowledge—be they the effects of the 'experiments of fruit', which are secondary (and Bacon warns they should remain secondary) by-products of the inquiry into nature, or the *magnalia naturae*, i.e., the great effects of the apex of operative science, (reformed) natural magic. Such effects, though, especially the latter, cannot be attained unless inquiry itself is fruitful—not in the sense that it issues in end-products, but in the sense that it generates clues (both theoretical clues and experimental clues) useful for the furthering of inquiry until it runs its full course. For inquiry to run its course according to Bacon, it must reach 'forms', or the highest axioms of nature, which represent both the material essences of things and the rules for producing great effects. The route to that end, he claims, can only be 'the true order of experience', i.e., the passing from 'experience' of particulars (the 'dissection' of nature by means of experiments and the 'digestion' of experimental and natural historical information in an orderly way) to the formation of low-level axioms and on to the discovery of new experiments and new particulars, which in turn will generate higher-level axioms, etc.<sup>9</sup> This process involves a continuous and methodical return to particulars, which are 'the procreative parts', as it were, of inquiry.<sup>10</sup> Such constant return is the only fruitful way to progress towards the 'marriage' of the mind

8 Daniel Andersson has alerted me to the complexity of Reformed revaluations of the theological virtues in Elizabethan England, which still await a thorough historical account. I thank him for allowing me to read the relevant parts of his manuscript work on early modern practical divinity, "Of Grace and Knowledge: The Transmission of Practical Divinity", in advance of publication.

9 Bacon, *Novum organum* I.82, OFB XI, 131. Cf. I.103, OFB XI, 161. On the speculative-operative distinction and the double 'scale' of Bacon's philosophy (ascending to axioms and descending to effects), see idem, *Advancement of Learning*, ed. M. Kiernan, OFB IV, 80, 88; *De augmentis scientiarum*, SEH IV, 343, 346. For the variations in this distinction throughout Bacon's writings, see Anstey P., "Francis Bacon and the Classification of Natural History", *Early Science and Medicine* 17 (2012) 11–31.

10 Bacon, *Instauratio magna* preliminaries, OFB XI, 13.



and things that alone can breed the 'line of discoveries' (*stirps Inuentorum*) which knowledge seeks.<sup>11</sup>

The importance of the beneficial end-products of the Baconian natural inquiry should not blind us to the equal (perhaps even greater) importance he assigned to the fruitfulness of the process of inquiry itself, as well as to that of the transmission of knowledge. I want to suggest here that for Bacon these types of 'fruit' are members of the 'benefit and use' to which knowledge should be directed if it is to be used and perfected in charity. Moreover, I propose that for Bacon charity has not only external fruits (which include the fruitfulness of inquiry and transmission alongside the material benefits) but also internal fruits, i.e., a series of inner virtuous dispositions. These inner virtues associated with charity are transferred in Bacon's account from the moral-religious to the natural philosophical context and acquire an epistemic and methodological load; as such they become critical conditions for the very fruitfulness of inquiry and knowledge-transmission.

Before addressing the theme of the fruitfulness of knowledge, I want to look first at Baconian charity in its moral-religious context in order to establish its status as an inner virtue, and to see what it is that it carries over into the epistemic and methodological domains.

### Charity and the Good of the Mind

Charity features prominently in Bacon's moral doctrine, outlined in the *Advancement of Learning* (1605) and subsequently in the expanded Latin version of that work, *De dignitate et augmentis scientiarum* (1623). It has a key role in both branches of moral knowledge—the doctrine of the good (charity's target is the common good, which is the highest form of the good) and the culture of the mind, that is, the practical guide to attaining the good (charity constitutes the best form of this culture, capable above all the rest of achieving inner goodness). It is apparent from Bacon's discussion, as I am going to point out below, that he assigned to charity the quality of a virtue in the full sense of the term (an active inner disposition that perfects its subject by directing it in a stable manner towards the good), even if his version of the virtue of charity is not exactly the traditional one.

Bacon establishes that the common good (or the 'good of communion' or 'communicative good') is the highest form of the good by appeal to the 'laws

11 Bacon, *Distributio operis*, OFB XI, 37. This theme is excellently pursued and illuminated by Weeks, "Role of Mechanics".

of nature' in conjunction with 'Christian law'. Against the formal distinctions and disputations of traditional moral philosophies (especially the scholastic, but also, to some extent, the Stoic),<sup>12</sup> he urges, as in everything else, renewed attention to the nature of material things. If we look at them carefully, he tells us, we will see that all of them display an appetite towards the 'conservation of a more general form', which supersedes the appetite that tends towards the good of the individual. Bacon calls this natural appetite 'love', as well as 'duty'. 'Duty' is thus, in this respect, apt to designate the natural tendencies of material things. With respect to man, the term is meant to cover both this natural sense and the sense of an obligation corresponding to a law of commandment. In the context of the discussion of natural appetites, he writes: 'This prerogative of the communion of good is much more engraven upon man, if he be not degenerate', thus signalling, by means of the latter qualification, the extension of the law of nature into a law of commandment. The two are nevertheless in close correspondence: 'it was the same God, who gave the Christian law to men, that gave also those laws of Nature to inanimate creatures'. Christian faith teaches the best example of the good of communion through its saints and their acts of self-sacrifice performed 'in an ecstasy of charity and infinite feeling of communion'.<sup>13</sup>

Charity orients man towards the service of others, thus accomplishing the 'duty' (at once natural inclination and Christian commandment) of working for the common good. The superiority of this good compared with individual or private good has as a consequence the fact that some of the types of individual good acquire their full goodness, so to speak, only when referred to the duty of serving others. Individual good can be either active or passive. Active good corresponds to the material appetite of self-multiplication and propagation, and in the human sphere it takes the form of 'effecting things', of 'deeds and works', and of 'enterprises, pursuits and purposes of life'. This is surely the description of an active life, which includes, for instance, 'acts of beneficence'. Yet such acts may be pursued with a view to 'a man's own power and greatness', and not to 'the good of society' (an extreme example is that of the 'gigantean state of mind, which possesses the troublers of the world').<sup>14</sup> The active good seems thus to fall short of a moral good altogether unless it is directed towards others and thus becomes communicative good. Similarly, one of the types of

12 Bacon, *De augmentis scientiarum*, SEH V, 4, 23; *Advancement of Learning*, OFB IV, 134, 150. The critique of the schools is extended in *De augmentis scientiarum*.

13 Bacon, *De augmentis scientiarum*, SEH V, 6–7; *Advancement of Learning*, OFB IV, 136–137. Cf. the 'quaternion of good' in *Valerius Terminus*, SEH III, 229–230.

14 Bacon, *De augmentis scientiarum*, SEH V, 12; *Advancement of Learning*, OFB IV, 140.

the passive good, the good of self-preservation or fruition, which corresponds to a similar material appetite, has a double sphere: 'sincerity', represented by tranquillity or serenity of mind, and 'vigour', which stands for strength of mind, or 'magnanimity'. Moral philosophy, Bacon tells us, had been too much devoted to tranquillity, seeking to 'make men's minds too uniform and harmonical, not breaking them to contrary motions and extremes'. But the combination of harmony with vigour and strength is much more valuable, and it will be obtained if men apply themselves to the duties of public life.<sup>15</sup> The passive good of fruition, therefore, also acquires its full goodness from the good of communion.

'Duty' is a proper name for the good of communion. Are we talking of an ethics of duties, then? Not really, because the content of 'duty' here is not that of regulation of social relations; rather, Bacon explains that the term is 'proper to a mind well framed and disposed towards others', just as the term 'virtue' is 'applied to a mind well formed and composed in itself'.<sup>16</sup> In the *Advancement of Learning*, he reinforced the relationship between the two: 'neither can a man vnderstand vertue without some relation to Society, nor duety without an inwarde disposition'.<sup>17</sup> He skipped this passage in *De augmentis*, yet preserved the next sentence, which clarifies the sense in which 'duty' is properly treated under moral philosophy, and not under 'science civil and politic': 'for it concerns the regimen and government of every man over himself, and not over others'.<sup>18</sup> Duty or communicative good describes a good of the mind and not rules of social relations. It describes the best conformation of the mind of man, and the orientation towards an active life of service to others is part of that conformation. This orientation, for instance, ensures the right combination of tranquillity and strength, serenity and magnanimity, which is the substance of private virtue. Bacon presses the point that, unlike civil philosophy, which looks to the functioning of the social space, moral philosophy looks to the government and proper framing of the mind of man,<sup>19</sup> or to the 'internal goodness' of man, as opposed to the 'external goodness' addressed by civil philosophy (and which might well be without internal goodness).<sup>20</sup>

As conducive to communicative good within this Baconian scheme, charity is therefore firmly rooted in a doctrine of internal goodness. It is not reduced to an external act or activity, and it is not subsumed under an ethics of duties.

15 Bacon, *De augmentis scientiarum*, SEH V, 13–14; *Advancement of Learning*, OFB IV, 141–142.

16 Bacon, *De augmentis scientiarum*, SEH V, 15; *Advancement of Learning*, OFB IV, 142.

17 Bacon, *Advancement of Learning*, OFB IV, 142.

18 Bacon, *De augmentis scientiarum*, SEH V, 15; *Advancement of Learning*, OFB IV, 142.

19 Bacon, *De augmentis scientiarum*, SEH V, 18; *Advancement of Learning*, OFB IV, 145.

20 Bacon, *De augmentis scientiarum*, SEH V, 32; *Advancement of Learning*, OFB IV, 156.

It is, indeed, an inner virtue; and as such it does not operate in a legalistic context, but in a cultivating one: charity is further highlighted by Bacon as the best ‘culture of the mind’, that is, as that which is capable of training, educating, curing, or cultivating the mind of man towards the good. Bacon proposes his practical moral doctrine as a corrective to the sterility of traditional (scholastic) moral theorizing. He takes his cue from Aristotelian and Roman Stoic calls to turning moral doctrine into a rule of life and sketches his own version of the types of exercises capable of training the will and affections of man in the right way. He ends his discussion by recommending the choice of ‘good and virtuous ends’ to be pursued with constant resolution as the best remedy for the mind’s distempers. Doing so should make it possible, we are told, to mould the mind into all the virtues at once, unlike the exercises of habit, which mould the virtues piecemeal:

[I]n obtaining virtue by habit, while we practise temperance, we do not advance much in fortitude, nor the like; but when we dedicate and apply ourselves entirely to good and honest ends, what virtue soever the pursuit and passage toward those ends suggests and enjoins, we shall find ourselves invested with a precedent disposition and propensity to conform thereto.<sup>21</sup>

While this is a notion the ancients had also recognized, it is more truly advanced by the Christian faith under the form of the virtue of charity, rightly called the ‘bond of Perfection’, since it ‘comprehends and fastens all virtues together’.<sup>22</sup> In order to give a representation of what the work of the virtue of charity is in man’s heart, Bacon finds Xenophon’s description of love most apposite: ‘all other affections though they raise the mind, yet they distort and

21 Bacon, *De augmentis scientiarum*, SEH V, 28; *Advancement of Learning*, OFB IV, 154.

22 Bacon, *De augmentis scientiarum*, SEH V, 29; *Advancement of Learning*, OFB IV, 154. Cf. Colossians 3.14. That charity is the bond of inner perfection (the ‘form of all the other virtues’) is also a Thomistic notion: Aquinas Thomas, *Summa Theologica*, trans. Fathers of the English Dominican Province, 3 vols. (London: 1947) vol. II, 2a2ae Q 23 art. 8. For Aquinas charity is a theological and therefore an infused virtue—an idea that is absent in Bacon. Despite the important differences, however, there is a structural parallelism between Baconian and Thomistic charity: in both cases, charity is the bond of the other virtues; its core act is love; and it has both interior and exterior effects (among the former Aquinas lists the virtues of joy, peace, and mercy; among the latter, beneficence, alms-deeds, and fraternal correction). For Aquinas, see *Summa Theologica* 2a2ae QQ 23, 27–32; for Bacon, see below.

disorder it by their ecstasies and excesses, but only love at the same time exalts and composes it'.<sup>23</sup>

Charity is the disposition to seek and perform communicative good, pursued with constant resolution. Seen as a disposition of internal goodness, it moulds the soul into all the virtues at once. The ingredients of this virtuous disposition of the soul are suggested in several places by Bacon. One is the same quotation from Xenophon, which highlights a (paradoxical) combination of composure and exaltation. This combination corresponds to what Bacon describes in other places as the union of a virtue of composure and tranquillity with an active, confrontational virtue. The notion is present, as we have seen, in the call for a combination of harmony with vigour of mind in the discussion of the passive good of fruition. It also features in Bacon's highlighting of health and strength, alongside beauty, as the elements of the 'good of the mind'. For Bacon, the classical ideal of tranquillity is not devoid of interest: the 'even temper' of the mind and its freedom from perturbations, which constitute its 'health', are part of the good of the mind. But only one part, he warns, since a truly good condition of the mind also involves an 'active power' that constitutes its strength. The latter is always directed to an outward object (it needs a 'partner in nature') and its inner action is to raise, enlarge, and inflame the mind. Health is equivalent to serenity, tranquillity, temperance; strength, to magnanimity and fortitude, as well as to liberality and magnificence.<sup>24</sup> Health and strength, temperance and fortitude, serenity and magnanimity combined, are—we are given to understand—the inner fruits of the composure and

23 Bacon, *De augmentis scientiarum*, SEH V, 29; *Advancement of Learning*, OFB IV, 155. Cf. Xenophon, *Symposium* I.x, in idem, *Memorabilia, Oeconomicus, Symposium, Apology*, trans. E.C. Marchant – O.J. Todd (Cambridge, MA: 1997) 539.

24 Bacon, *De augmentis scientiarum*, SEH V, 30; *Advancement of Learning*, OFB IV, 156; *Advice to the Earl of Rutland on His Travels*, in Bacon Francis, *The Major Works*, ed. B. Vickers (Oxford: 2008 [1996]) (hereafter *Major Works*) 69–71, 75–76; *Of Tribute*, in *Major Works* 22, 29. The Baconian active virtues owe something to the Roman Stoic descriptions of the exaltation and greatness of spirit as an ingredient of virtue, e.g. Cicero Marcus Tullius, *On Duties* I.xviii–xxi, trans. W. Miller (Cambridge, MA: 1997) 61–74; Seneca Lucius Annaeus, Ep. LXVI, LXXI, in *Epistles* 66–92, trans. R.M. Gummere (Cambridge, MA: 1996) 21, 85. The collaboration between the virtues of temperance and those of fortitude (e.g., between humility and magnanimity) is also recommended in Aquinas, *Summa Theologica* 2a2ae Q 161 art 1. Cf. also the discussion in John Case's commentary on the *Nicomachean Ethics*, *Speculum quaestionum moralium* (Oxford: 1596 [1585]) 213–225. While Bacon echoes this idea, as he does the Thomistic notion of charity as the bond of the other virtues (see note 22 above), he also suggests a more direct association between charity and the union of temperance and fortitude, which is absent in these sources.

exaltation of mind performed by the virtue of charity. Bacon's original move is to explicitly interpret the moral virtues of tranquillity and strength (with their cognates) as the inner virtuous dispositions wrought in the human heart by the virtue of charity.

Baconian charity is not the theological, infused virtue of the Thomistic tradition. Neither is it an externalized action regulated by social duties. It has its own idiosyncratic shape, but one which preserves the status of an inner virtue: it is a virtue conducive to internal goodness owing to its capacity of orienting the mind of man towards communicative good in a stable manner. It works on the will and affections of man in such a way that they become able to transcend the private self. Indeed, as we have seen, for Bacon private good itself is worthy of the name of goodness if it is oriented beyond the private sphere towards the good of communion.<sup>25</sup> In what follows, I will be concerned with the way Baconian charity—thus understood—is transferred into the domain of the pursuit of natural knowledge both as the great orienting aim of that pursuit and via its inner fruits.<sup>26</sup>

### Pride, Humility, and the 'Oracles of God's Works'

There are two major textual clues that signal the transfer of the notion of charity from the moral to the natural philosophical context in Bacon's early writings. Firstly, the discussion of the culture of the mind and of charity as its culmination in the *Advancement of Learning* closes with a gesture towards the biblical story of the Fall: the aspiration to God-like power and knowledge caused the fall of angels and men, but 'by aspiring to a similitude of God in goodnesse or loue, neyther Man nor Angell euer transgressed or shall transgresse. For vnto

25 The self-transcendence charity alone can perform is also the theme of the closing part of the essay "Of Goodnesse, and Goodnesse of Nature", in *Essays*, ed. M. Kiernan, OFB xv, 38–41.

26 On the proximity between Bacon's moral/religious thought and his programme for natural inquiry, see Box, "Bacon's Moral Philosophy"; Briggs, "Bacon's Science and Religion". For very insightful discussions of Baconian virtues that are transferred into natural philosophy and thus acquire epistemic functions while at the same time preserving their original moral or theological loads, see Prior, "Bacon's Man of Science"; Le Doeuff M., "Hope in Science", in Sessions W. (ed.), *Francis Bacon's Legacy of Texts* (New York: 1990) 9–24. An extended discussion of the Baconian virtues is in Minkov S.Y., *Francis Bacon's "Inquiry Touching Human Nature": Virtue, Philosophy, and the Relief of Man's Estate* (Lanham: 2010), who nevertheless downplays the other-regarding dimension of Bacon's notion of virtue and thus dismisses Baconian charity.

that imitation we are called'.<sup>27</sup> The same idea in an almost identical phrasing opens Bacon's first sketch of his platform for the reformation of natural philosophical knowledge, *Valerius Terminus*. He adds there that goodness and love are really the same thing, since love is 'goodness put in motion or applied'.<sup>28</sup> Secondly, the opening of the culture of the mind section in the *Advancement of Learning* reinforces the idea of the good as the orienting and transforming aim of one's whole life by a quote from Seneca's *Epistles*: 'we all consider the parts of life, but never life as a whole'.<sup>29</sup> The same quotation features in *Valerius Terminus* in the context of a discussion of the 'end and scope of knowledge',<sup>30</sup> as a reminder of the notion that, if it is to be legitimate, the pursuit of (natural) knowledge must be referred to 'use and action' and that both knowledge and power are to be 'dedicated to goodness or love' and thus to be pursued in charity.<sup>31</sup> It is therefore from the cultivating context of Bacon's practical moral philosophy (with its religious accents) that charity is transferred into the natural philosophical context.

The legitimacy of natural knowledge had to be defended against the Puritan and ultimately Augustinian injunction against knowledge that 'puffeth up' as a consequence of the Fall.<sup>32</sup> The core of this defence in Bacon's hands was the explanation of the nature of that transgression: it was not the desire for natural knowledge that brought about the first sin (Adam was already in possession of that knowledge and enjoying its exercise), but the 'proude knowledge of good and euill, with an intent in man to giue law vnto himselfe, and to depend no more vpon Gods commaundements'.<sup>33</sup> Man's transgression was to aspire to be privy to the origin of good and evil, that is, to God's will, and thus to share and ultimately to usurp the role of author of the law of his own being. Man's

27 Bacon, *Advancement of Learning*, OFB IV, 155; *De augmentis scientiarum*, SEH V, 29.

28 Bacon, *Valerius Terminus*, SEH III, 217.

29 '(Ideo peccamus quia) de partibus vitae omnes deliberamus, de tota nemo deliberat.'—Seneca, Ep. LXXI, *Epistles*, 73; Bacon, *Advancement of Learning*, OFB IV, 146.

30 Bacon, *Valerius Terminus*, SEH III, 232.

31 Ibidem 222.

32 See 1 Corinthians 8.1. For Bacon on the Fall, see Harrison P., *The Fall of Man and the Foundations of Science* (Cambridge: 2007) 172–183; Lewis R., *Language, Mind and Nature: Artificial Languages in England from Bacon to Locke* (Cambridge: 2007) 110–128; Matthews, *Theology and Science* 65.

33 Bacon, *Advancement of Learning*, OFB IV, 6. Cf. idem, *Valerius Terminus*, SEH III, 217, 219. For Adam's 'contemplation of the creatures' before the Fall pursued as 'matter of delight in the experiment and not matter of labor for the vse', see Bacon, *Advancement of Learning*, OFB IV, 34. Postlapsarian man must aim for 'use', but Bacon seems to voice his nostalgia for a pure (prelapsarian) enjoyment of knowledge in "Of Truth", OFB XV, 8.



first sin was indeed the sin of pride. As far as natural knowledge is concerned, although it had nothing to do in the Fall, it may nevertheless become tainted by the sin of pride in this postlapsarian world. Bacon thinks indeed that all of the previous ways of natural inquiry had been, to a larger or lesser extent, thus tainted. But the only remedy for a pride-infected search of natural knowledge is the one virtue that is capable of transcending the individual self: charity. According to Bacon, charity has the role of imparting to rightful natural knowledge both its legitimate boundaries and its legitimate ends. On the one hand, knowledge acquired by sense and reason cannot discover the nature and will of God, therefore the mysteries of religion remain outside the limits of natural inquiry. Any attempt to transgress this limit would bespeak the same debilitating pride that brought about the first defection of man; charity, we are told, is the rightful guardian of this boundary.<sup>34</sup> On the other, natural knowledge is capable of discovering the essences of things for the use and benefit of man, provided that it is protected from the dangers of pride. Such protection can only come, again, from charity, the only 'corrective spice' of knowledge.<sup>35</sup>

Once this is established, Bacon argues in *Valerius Terminus*, we will understand that the true end of knowledge is constituted by

a restitution and a reinvesting (in great part) of man to the sovereignty and power (for whensoever he shall be able to call the creatures by their true names he shall again command them) which he had in his first state of creation. And to speak plainly and clearly, it is a discovery of all operations and possibilities of operations from immortality (if it were possible) to the meanest mechanical practice.<sup>36</sup>

The recuperation of the sovereignty and dominion of man over natural creatures, and the discovery of the ways to operate on nature that constitute that dominion, are indeed the 'benefit and use' of knowledge, pursued by 'goodness put in motion'. Such restitution is a 'work divine', but one which necessarily involves 'humility of mind', as a corrective to postlapsarian pride:

For as in the inquiry of divine truth, the pride of man hath ever inclined to leave the oracles of God's word and to vanish in the mixture of their own inventions; so in the self-same manner, in inquisition of nature they

34 Bacon, *Valerius Terminus*, SEH III 218–219; *Advancement of Learning*, OFB IV, 8.

35 Bacon, *Advancement of Learning*, OFB IV, 7.

36 Bacon, *Valerius Terminus*, SEH III, 222.



have ever left the oracles of God's works, and adored the deceiving and deformed imagery which the unequal mirrors of their own minds have represented unto them.<sup>37</sup>

In natural inquiry, the correct approach is to bring the mind of man close to the 'oracles of God's works' or else to natural things (just as in theological inquiry, it is to try to bring the mind back to God's words), as opposed to allowing it to create an 'oracle' of its own. Bacon was to pursue this thought persistently throughout his writings and to use it as the framework for his critique of previous schools of philosophy and their approaches to natural inquiry.

In the *Advancement of Learning*, his prime target is the 'contentious' learning of the schoolmen, whose 'subtiltie', 'curiositie', and 'fruitlesse speculation or controuersy' take the mind away from things and allow it to 'worke vpon it selfe'. Their method of syllogistic demonstration is not only a flawed approach to nature, according to Bacon, but also the result of a distempered movement of the mind (an 'infinite agitation of wit'), itself associated with the sin of pride, which prompts them to seek 'oracles' in the cells of their brains rather than in the particulars of the material world.<sup>38</sup> In the *Novum organum* (1620), Bacon extends his critique to include not only the scholastics (the 'sophistical' school), but also the 'empirical' and the 'superstitious' (Platonic) philosophies. The latter in particular, which mix philosophy and theology in an unwholesome way and thus produce philosophies of nature grounded in imagination alone, are guilty of a specific type of ambition: 'For there is in man a kind of ambition of intellect no less than of will, especially in exceptionally gifted and exalted individuals'. Yet this 'kind of evil' is not limited to the 'superstitious' philosophy, but characterizes the scholastic ('sophistical') philosophy as well, as can be seen in their 'abstract forms, final and first causes, and in the all-too-frequent omission of intermediate causes and the like'.<sup>39</sup> In fact, even the empirical school, whose approach to experience is much more careful than the others', is ultimately guilty of the same fault of indulging the 'premature and precipitate onrush of the intellect and its tendency to jump the gun and fly off toward the generalities and principles of things'.<sup>40</sup>

The affection of pride is responsible for two related faults of inquiry: the disdain of 'vulgar' particulars and the love of generalities. Indeed, the latter

37 Bacon, *Valerius Terminus*, SEH III, 223–224.

38 Bacon, *Advancement of Learning*, OFB IV, 24–25, 30.

39 Bacon, *Novum organum* I, 65, OFB XI, 101–103.

40 Bacon, *Novum organum* I, 64, OFB XI, 101.

belongs to the 'mysteries of pride'.<sup>41</sup> Bacon repeatedly insisted that it is only by means of contact with the ('humble and transitory') particulars of experience that the mind will be able to reach (and become united with) the things themselves. Consequently, the construction of good natural and experimental histories and the renewed generation of experiments and collections of particulars along the steps of the 'order of experience' are of the essence for bridging the gulf between mind and things. But following such 'order' requires 'a true and legitimate abasement of the human spirit', or a spirit of humility ('*humilitas*') at work in both discovery and the passing on of knowledge.<sup>42</sup> Erecting speculative philosophies of nature with only a superficial examination of particulars is therefore a procedure that carries all the moral-theological load of the first sinful rebellion: instead of discovering the true essences of things and thus the 'seal that the Creator has set upon them', we 'seal our own image on the creatures'. In this way 'we imitate our first parents' sin' and 'we deservedly lose our power over created things' once again.<sup>43</sup>

Pride has a key role for Bacon in diagnosing the gulf between the mind of man and the nature of things. As we will see further on, this gulf is also expressed in Bacon's matter theory. But its association with pride (on the mind's side), and thus with its roots in the biblical story of the Fall, gives a moral-theological amplitude to the gulf. At the same time, the moral-theological dimension is subtly translated by Bacon into an account of the inner workings of the mind in natural inquiry. Pride, we are told, is not simply a moral-theological vice (a vice of the will), but can take the form of an ambition of the intellect, which accounts for its agitation and impatient onrush to abstractions, which lose contact with the nature of things. This is indeed the innate tendency of the intellect 'left to itself', Bacon insists.<sup>44</sup> Thus, a moral-theological vice acquires an epistemic load that explains one of the key vices of inquiry. Conversely, the virtue that counters pride in the moral realm, humility as governed by charity, acquires a similar load: it takes the form of the inquirer's capacity to resist self-insulation and to address himself to the things themselves by following the

41 Bacon, *Valerius Terminus*, SEH III, 250–251. Cf. also idem, *Novum organum* I, 49; I, 120, OFB XI, 87, 179–181; *De augmentis scientiarum*, SEH IV, 296–297.

42 '[...] vera et legitima spiritus humani humiliatio'—Bacon, *Instauratio magna* preliminaries, OFB XI, 20–21.

43 Bacon, *Historia naturalis et experimentalis*, ed. G. Rees, OFB XII, 7, 9. For Baconian pride and self-insulation in the natural philosophical context, see also Prior, "Bacon's Man of Science"; Le Doeuff, "Hope in Science"; Matthews, *Theology and Science* 96–97.

44 Bacon, *Instauratio magna* preliminaries, OFB XI, 19; *Distributio operis*, OFB XI 33; *Novum organum* I, 115, OFB XI, 173.

'order of experience', which should be able to compose the agitation of wit and to bridle the onrush of the intellect. Charity has thus, in this respect, and via its companion, humility, a tempering effect, since it can transcend the agitation of mind with which pride is associated. By keeping the inquirer's focus on the self-transcending 'use and benefit' of his endeavours, it thus contributes to the union between mind and things on which the restitution of man's dominion depends. But the full inner effect of charity, we have seen, is a combination of temperance and strength, or else composure and exaltation; it is to the latter's role in the pursuit of natural philosophical knowledge that we now turn, which will also allow us to understand the inclusion of the fruitfulness of inquiry and tradition among the external effects of charity.

### Self-Satisfaction, Strength, and the Experimental Art of Direction

The route to man's regained dominion over nature can only be via a 'reliable and sound partnership with things'.<sup>45</sup> The 'commerce between the Mind and Things' is the most precious achievement on earth, and the foundation of the restoration.<sup>46</sup> One key obstacle on this route is the very inadequacy of the human senses: they are simply not fit to grasp the real nature of things, which lies beyond the level of the naked senses. The observable phenomena are in fact results of the invisible motions, processes, and structuring patterns of matter, in turn commanded by the primary, originating natures ('forms').<sup>47</sup> Instruments, although capable of extending the penetration of the senses, are inadequate to the task of piercing the boundary that separates the senses from the essential natures animating matter, or the 'things themselves'. Instead, that task is best accomplished with the aid of well-gathered 'instances' and of 'apt

45 Bacon, *Phaenomena universi*, ed. G. Rees, OFB VI, 3.

46 Bacon, *Instauratio magna* preliminaries, OFB XI, 3; "The Praise of Knowledge", *Major Works* 36; *Distributio operis*, OFB XI, 37.

47 Bacon, *Novum organum* I.66, II.1–3, II.48, OFB XI, 103–107, 201–203, 383–417; *De augmentis scientiarum*, SEH IV 347–357; *Abecedarium nouum naturae*, OFB XIII. On Bacon's matter theory and its shaping role in his conception of experimental inquiry, see Rees G., "Matter Theory: A Unifying Factor in Bacon's Natural Philosophy", *Ambix* 24 (1977) 110–125; idem, "Bacon's Speculative Philosophy", in Peltonen M. (ed.), *The Cambridge Companion to Bacon* (Cambridge: 1996) 121–145; idem, Introductions to OFB VI, xxxvi–lxix, OFB XIII, xxxvi–xlvi; Giglioni G., "Mastering the Appetites of Matter: Francis Bacon's *Sylva Sylvarum*", in Wolfe C.T. – Gal O. (eds.), *The Body as Object and Instrument of Knowledge: Embodied Empiricism in Early Modern Science* (Dordrecht: 2010) 149–167; Weeks S., "Francis Bacon and the Art-Nature Distinction", *Ambix* 54 (2007) 117–145.

and appropriate experiments', to which is added a healthy method of inductive reasoning, which proceeds by wide-ranging comparison and elimination and by successive degrees of generalization which are suggested, confirmed, or dismissed by the experimental instances.<sup>48</sup> These are the general lines of Bacon's 'art of direction' or of inquiry into nature, in which experiment has a core, generating role.

Wisely directed experiment is indeed the only viable key to the invisible natures of things, since it is apt to 'vex' nature out of its common course and display its hidden face.<sup>49</sup> In 'mechanical operations', that is, the operation on nature by means of experiment, 'we see nature's modes and processes, not just its effects'.<sup>50</sup> Thus, an experimental or mechanical history of nature is the only opening of inquiry that sets it on the right path, towards the things themselves. The experimental 'hunt' of nature is extended and organized by means of *experientia literata*, which further prepares the beginning of *interpretatio*, whose role is to derive axioms of increasing generality out of the gathered experiences (the business of physics and metaphysics in Bacon's scheme of natural science).<sup>51</sup> The axioms are both suggested by experiments and tested in their validity by means of experiments. According to Bacon, the 'discovery of new works and active directions not known before' is the only sure 'trial' of the truth of axioms. An axiom that is true will necessarily indicate new instances, not only in the sense that it can function as a recipe for the production of

48 Bacon, *Novum organum* I.50, I.98–105, OFB XI, 87, 155–163; *De augmentis scientiarum*, SEH IV, 412–413. For the Baconian programme of scientific research, see Jardine L., *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: 1974); Urbach P., *Francis Bacon's Philosophy of Science: An Account and a Reappraisal* (La Salle: 1987); Malherbe M., "Bacon's Method of Science", in Peltonen M. (ed.), *The Cambridge Companion to Bacon* (Cambridge: 1996) 75–98.

49 Bacon, *Parasceve ad historiam naturalem*, OFB XI, 463; *Distributio operis*, OFB XI, 39; *De augmentis scientiarum* SEH IV, 287, 298. See Pesic P., "Wrestling with Proteus: Francis Bacon and the 'Torture' of Nature", *Isis* 90 (1999) 81–94; Weeks, "Role of Mechanics"; Anstey, "Francis Bacon and the Classification of Natural History" 17.

50 Bacon, *Phaenomena universi*, OFB VI, 5. Bacon's new logic, unlike syllogistic logic, will be able 'really to slice into nature, and discover the virtues and acts of bodies, and their laws as they are determined in matter' and is thus meant to ultimately achieve the union of the human mind and 'the very nature of things' (*Novum organum* I.52, OFB XI, 443).

51 On the special shapes of the Baconian natural history and *experientia literata*, see Rees's Introduction to OFB XII, xvii–xxxiii; Weeks, "Role of Mechanism"; Jalobeanu D., "The Philosophy of Francis Bacon's Natural History: A Research Program", *Studii de știință și cultură* 23 (2010) 18–36; Stewart I.G., "Res, veluti per Machinas, Conficiatur: Natural History and the 'Mechanical' Reform of Natural Philosophy", *Early Science and Medicine* 17 (2012) 87–111.

effects, but also in the sense that it points to the discovery of instances and the framing of experiments that can allow further insight into the nature under investigation.<sup>52</sup> Experiment, or 'operation' on nature, has therefore a multiple role: it 'dissects' nature in the first place, thus opening the mind's access to the things themselves; it generates further experiments which will help to enlarge and organize ('digest') the material of the natural history; it leads the mind's interpretation through the successive levels of generalization (axioms) by its theoretical suggestions; and it validates the axioms in the sense that, according to Bacon, a valid (true) axiom is one that can generate further questions and experiments.

The key feature of Bacon's art of direction is that every step of it must be such that it generates the next step; the generation in question, moreover, can only be rooted in the particulars of nature, made available to the senses and the intellect through experiment (unless it is rooted in particulars, it becomes barren agitation of wit, or mere notional logic). Experiments generate wider-ranging experiments and questions; a well ordered and wisely conducted experimental history generates low-level axioms; these axioms in turn generate new particulars and experiments, which generate new questions and investigations, which generate higher-level axioms, until the interpretation of nature is complete with the discovery of the forms of nature, which are the generators of the natural-magical *magnalia naturae*. At every step, it is this generative power, or fruitfulness, that is of key interest to Bacon, and that forms the subject of his repeated warnings against the multiple ways in which inquiry can be prematurely arrested. A good number of the vices of inquiry and the resulting idols of the mind are forms of such arrest of investigation and thus forms of barrenness.

The true end of knowledge, Bacon repeatedly emphasizes, consists in 'use and benefit', or else 'fruit and works'. No doubt that these are partly represented by the practical effects of the operative side of Baconian inquiry, especially by the *magnalia*. But 'works' and 'use' are often used in Bacon's texts to refer to the fruitfulness of inquiry itself, in the sense explained above. For instance, experiments of light (which further inquiry) are to be preferred to experiments of fruit (which arrest inquiry) since 'revealing nature's oracles' is 'the *work of*

52 Bacon, *Valerius Terminus*, SEH III, 242; *Novum organum* I.81, I.124, OFB XI, 129, 187. For interpretations of this Baconian theme within the 'maker's knowledge tradition', see Pérez-Ramos, *Francis Bacon's Idea of Science*; alternatively, within the context of humanist moral philosophy, Gaukroger S., *Francis Bacon and the Transformation of Early-Modern Philosophy* (Cambridge: 2001) 155–159.

works and encompasses in itself all power'.<sup>53</sup> The empirics seek premature practical results, which bespeaks their pusillanimity.<sup>54</sup> They look for 'fruit-bearing' rather than 'light-bearing' experiments and run, like Atalanta, after second-order prizes, thus forgetting the end-point of the contest. The prime function of experiment in the investigation of nature is to offer clues ('light') for the furthering of inquiry along the rightful path, rather than to seek any practical result ('fruit') for its own sake.<sup>55</sup> Indeed, the fault of the empirics had been to devise experiments 'for practical not *philosophical use*'. Experiments are both 'trustworthy interpreters of causes' and 'sure and *fertile indicators* of effects and of works'.<sup>56</sup> The same experimental data can be turned to practical use, but are also '*useful for inquiring*' into a particular nature (for example, that lobsters turn red when cooked is a useful practical indicator, but is also a useful operative indicator in that it directs further explorations of the nature of redness).<sup>57</sup> Similarly, the assessment of barrenness versus fruitfulness in terms of 'fruit and works' also characterizes the transmission, or 'tradition', of natural philosophical knowledge. Former philosophies, and especially the scholastic, are castigated for their barrenness not only in their way of inquiry but also in the 'handling down and passing on of the disciplines'. Instead of bringing forth 'fruit and works, they give rise instead', Scylla-like, to 'quarrels and barking disputations'. The causes of such sterility are the 'audacity' of the authors, the 'idleness' of their successors, and the credulity and lazy admiration of the populace. The effect is that both claims and questions of a philosophy are incapable of generating further claims and questions across generations (they remain 'mere claim[s]' and 'mere question[s]').<sup>58</sup> The barrenness of tradition, therefore, is ultimately rooted in the barrenness of inquiry itself.

The subsuming of the fruitfulness of inquiry (based on the fruitfulness of the experimental operation on nature) under the end of knowledge is clearly indicated in *Valerius Terminus*. There, the end of knowledge commanded by charity was said to consist, we recall, in the restitution of human dominion

53 Bacon, *Phaenomena universi*, OFB VI, 5. Emphasis mine.

54 Bacon, *Novum organum* I.88, OFB XI, 141.

55 Bacon, *Instauratio magna* preliminaries, OFB XI, 17; *Valerius Terminus*, SEH III, 247; *Advancement of Learning*, OFB IV, 90; *De augmentis scientiarum*, SEH IV, 297; *Novum organum* I.70, I.99, I.118, OFB XI, 111–113, 157–159, 177–179.

56 Bacon, *Phaenomena universi*, OFB VI, 9. Emphases mine.

57 Bacon, *Parasceve ad historiam naturalem*, OFB XI 463. Emphasis mine.

58 Bacon, *Instauratio magna*, preliminaries, OFB XI, 11–15; *Novum organum* I.74, I.113, OFB XI 119, 171; Farrington B., *The Philosophy of Francis Bacon: An Essay on Its Development from 1603 to 1609 with New Translations of Fundamental Texts* (Liverpool: 1964) 62, 126–127.

over the creatures and thus in the discovery of all possible operations. Further on, Bacon resumes the discussion of the end of knowledge with more specific reference to his art of direction: the 'best and perfectest condition' of the true end of knowledge consists 'not in the worth of the effect, but in the nature of the direction'. Experimental directions that exhibit a 'fullness' conducive both to axioms and to effects are such that they allow both 'certainty' (they indicate a nature that will infallibly produce the investigated effect, e.g., whiteness) and 'liberty' (they direct the inquirer, via varied and extended experiments, to instances where, the nature being absent, the investigated effect will by necessity be absent as well—or what Bacon would later call 'negative instances').<sup>59</sup> The right kind of direction ensures that the pursuit of natural knowledge seeks 'operation' (or operative directions) rather than 'satisfaction (which men call truth)', although inquirers often err in this task since 'it is much easier to find out such causes as will satisfy the mind of man and quiet objections, than such causes as will direct him and give him light to new experiences and inventions'.<sup>60</sup>

Seeking 'satisfaction' is one of the key errors in inquiry. The need for satisfaction is the mind's need to rest in easy assurance, or its tendency to come to a standstill and interrupt the difficult route of searching, inquiring, and questioning. In *Cogitata et visa* (1607), 'mental satisfaction' is identified as a false goal of the sciences.<sup>61</sup> The same is addressed in the *Novum organum*, again in connection with the misplaced end of knowledge, which is identified here with setting 'a standard of truth which satisfies the mind and intellect by giving causes for things known long since, and not a standard which comes up with new pledges of works and new light of axioms'.<sup>62</sup> Elsewhere, the need for satisfaction is seen as the effect of the reliance on eloquent expression in natural philosophical investigations, which 'is too early satisfactorie to the minde of man, and quencheth the desire of further search, before we come to a iust periode'.<sup>63</sup> Bacon uses here the same mechanism of transfer we have noticed in the case of pride. (Self-) 'satisfaction' is a primarily moral term, that is made to serve the role of assessing, on the one hand, a vice of inquiry, and on the

59 Bacon, *Valerius Terminus*, SEH III, 235–36. *Novum organum* I.105–106, II, 12; OFB XI, 163–165, 221–237. See Jardine, *Francis Bacon* 120–123; Urbach, *Francis Bacon's Philosophy of Science* 172–176; Malherbe, "Bacon's Method of Science" 77–78; Weeks, "Role of Mechanics" 179.

60 Bacon, *Valerius Terminus*, SEH III, 232.

61 In Farrington, *Philosophy of Francis Bacon* 76.

62 Bacon, *Novum organum* I.81, OFB XI, 129.

63 Bacon, *Advancement of Learning*, OFB IV, 23.



other, a misdemeanour of the intellect: it thus acquires an epistemic load in its capacity to describe one of the key tendencies of the intellect responsible for the production of the idols that block inquiry. The mind's tendency to rest in self-satisfaction, compounded by pusillanimity, is in fact closely interlaced with the agitation of wit and the onrush of the intellect, which we have seen was associated with pride, particularly in the description of the movement of the intellect in premature generalization and abstraction (or 'anticipations'): whether left to its own devices or marshalled by the rules of dialectic, 'the mind longs to leap up to higher generalities to find rest there; and after a short while scorns experience'.<sup>64</sup>

Bacon transfers from the moral into the epistemic sphere not only the vices but also the virtues of inquiry, as rooted in vices and virtues of the mind: while the agitation and onrush of the mind requires a calming counteraction (the counterpart of the virtue of tranquillity in the moral sphere), the lazy satisfaction of the mind is in need of a remedy that activates its capacity to continue the search (the counterpart of the active virtue in the moral sphere). Indeed, while the 'humility of mind' is invested with the former role, the latter will be fulfilled by the 'resolution', 'strength', and 'patience' of mind whose task is to fight the mind's easy satisfaction with the anticipations.<sup>65</sup> The fruitfulness of inquiry into nature requires, according to Bacon, a course of investigation that makes full use of the generating force of particulars. It is this force that needs to guide the correct 'order of experience'. In order to make the mind of man come into contact with that force, the art of direction needs to overcome those innate tendencies of the intellect that are responsible for the gulf between the mind and the things themselves. It has to curb its pride and its need of satisfaction, and thus its agitation, precipitation, and laziness. The art of direction guided by the fruitful force of operation is thus at the same time an operation on the mind of man: it is a 'means of bettering and perfecting the exercise and practice of the human mind and intellect'.<sup>66</sup> The correct exercise of the intellect in natural discovery, Bacon thinks, is an effort guided by the virtues

64 Bacon, *Novum organum* I.20, OFB XI, 71. For a reading of these two interrelated vices of the intellect in terms of the epistemic as well as physiological motions of the imagination, see Corneanu S. – Vermeir K., "Idols of the Imagination: Francis Bacon on the Imagination and the Medicine of the Mind", *Perspectives on Science* 20 (2012) 183–206.

65 Bacon, *Valerius Terminus*, SEH III, 245.

66 Bacon, *Instauratio magna*, preliminaries, OFB XI, 21. For the therapeutic nature of the Baconian art of direction, see Box, "Bacon's Moral Philosophy" 279–280; Jalobeanu D., "Experimental Philosophers and Doctors of the Mind", in Alexandrescu V. – Thais R. (eds.), *Nature et Surnaturel: Philosophies de la nature et métaphysique aux XVI<sup>e</sup>–XVIII<sup>e</sup> siècles* (Hildesheim: 2010) 37–63; Corneanu S., *Regimens of the Mind: Boyle, Locke, and*



of humility and temperance in conjunction with those of resolution, strength, and patience. We have seen that in the cultivating context of his moral doctrine, Bacon suggested that these virtues are the inner fruits of the exercise of charity. I have proposed that he performs a transfer of these virtues from the moral to the natural philosophical context in such a way that they acquire an epistemic and a methodological role. That is to say, they are now seen as regulating the native tendencies of the intellect and therefore its behaviour in natural inquiry. They are thus made to serve the goal of the fruitfulness of what Bacon saw as the correct course of the investigation of nature. This goal is one of the external fruits of charity, understood as the stable disposition to seek the good of communion.

### Conclusion

Bacon repeatedly came back to the question of the ends of knowledge, throughout his writings. The structure of his discussions of the topic is stable through his early and late texts, and it consists of a contrast between the true ends and the false ends of knowledge. The true ends reunite the three main ideas we have reviewed: that knowledge is to be pursued with a view to man's 'benefit and use', in order to 'supply human life with new discoveries and resources', and thus that knowledge is to be 'perfected and regulated in charity'; that the end of knowledge is the restitution of human (Adamic) sovereignty over the creatures, which would come with the discovery of all possible operations; and that sovereignty is to be associated with the 'happy match between the mind of man and the nature of things'. In contrast, the false ends of knowledge specify the various vices of inquiry we have also surveyed: seeking knowledge for immediate 'fruit', coupled with an ambitious desire for power, fame, and mercenary gain; being motivated by pride, which is associated by Bacon, especially in the case of the scholastics, with their fruitless 'curiosity' and their practice of disputation; and seeking lazy satisfaction of mind instead of pursuing the effort of renewed inquiry.<sup>67</sup> The very structure of these passages suggests that charity, as directed to the benefit and use of man, is meant to counter the vices of inquiry, which are governed by such moral-cognitive vices of the mind as

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*the Early Modern Cultura Animi Tradition* (Chicago: 2011) Ch. 1; Stewart, "Res, veluti per Machinas, Conficiatur".

67 Bacon, "The Praise of Knowledge", *Major Works* 36; Valerius Terminus, SEH III, 222; *Advancement of Learning*, OFB IV, 31; *Novum organum* I.81, OFB XI, 129; *Instauratio magna* preliminaries, OFB XI, 23.

pride, need for satisfaction, and pusillanimity, themselves associated with distempers of all the mind's powers (reason, imagination, will, and affections). The rectification of inquiry, in order to reach the marriage of mind and things, and thus to recuperate the lost sovereignty of man, involves a rectification of the mind with all its capacities. This double rectification (of the mind and of inquiry) is the work of the continued and illuminating contact with the natural particulars that Bacon's art of direction proposes to achieve, via the activation of such moral-cognitive virtues as humility, temperance, resolution, strength, and patience—or else, the inner fruits of charity. The consequences of that work—or the outer forms of charity—include not only useful material effects, but also the very fruitfulness of inquiry and of tradition.

Sometimes, Bacon even seems to be inclined to say that this type of fruitfulness is more valuable than the end-products. Aphorism 124 of the *Novum organum* emphasizes the marriage-of-mind-and-things component of the end of knowledge: 'For I lay foundations in the human intellect for a true pattern of the world as we actually find it and not as someone's private reason hands it down to him'. This permits him to say that the goal of knowledge as he understands it is indeed the 'contemplation of the truth of things'. But it would be wrong to say that this end is distinct from 'utility and magnitude of works', since the marriage of mind and things 'cannot be achieved unless we undertake a most painstaking dissection and anatomy of the world'. Such dissection (by means of both experiment and wisely conducted interpretation) is meant to reach the essences of things, the 'things themselves'. And it is those essences that are in fact the fountains of both truth and utility, as long as we take the 'works' (*Opera*) as 'guarantors of truth' rather than as 'providers of material benefits'.<sup>68</sup> Here 'utility' is understood primarily in the sense of the 'philosophical use' of the operative side of Bacon's inquiry (the 'dissection' of the world).

Similarly, aphorism 129 closes the series devoted to the arguments of hope and invites the reader to consider 'the excellence of the goal we aim at'. He tells us that one of the noblest ambitions of man (so noble that it can hardly be called an ambition) is to 'renew and increase the empire of humanity itself over the whole universe of things.' But, Bacon continues, if 'utility of discovery' is held in such high esteem,

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68 Bacon, *Novum organum* I.124, OFB XI, 187. For comments on this aphorism, see Rossi, *Philosophy, Technology, and the Arts* 157–160; idem, "Bacon's Idea of Science" 36–37; Weeks, "Role of Mechanics" 191. The epistemic benefit (the improvement of the intellect) involved here is pithily expressed in *Cogitata et visa*: since truth and utility are facets of each other in the sense explained, 'the improvement of man's mind and the improvement of his lot are one and the same thing'—in Farrington, *Philosophy of Francis Bacon* 93.

how much more noble will it seem to discover something to enable everything else to be rapidly discovered by means of it? And yet (to tell the whole truth) just as we love light because by it we can travel, practice our arts, read, and recognise each other, and yet actually seeing the light is still more excellent and beautiful than all its various uses, so surely is the very contemplation of things as they are [*ipsa Contemplatio Rerum, prout sunt*] without superstition or imposture, error or confusion, intrinsically more worthy than all the fruits of discoveries.<sup>69</sup>

To discover the means to discovery is the noblest thing; or else, the philosophical use of 'operation' understood as intervention into nature is even nobler than the production of 'operations' understood as end-products. There is utility in the latter, but there is also a sense of utility (or 'use', or 'fruit', or 'works') that corresponds to the former. And it is indeed this sense of utility (as generating healthy, fruitful inquiry) that is in complete agreement with the Baconian variant of 'contemplation': it is not contemplation in the traditional sense he is after (that would be contemplation of abstractions divorced from the nature of things), but the contemplation of 'things themselves', or else the marriage of mind and things.

While Bacon did thus entertain the thought that the generating instrument is more valuable than the generated product, it is still the case, one might say, that ultimately the apex of his programme was constituted by the *magnalia naturae*, or the natural-magical operations understood as indeed the end-products of the inquiry into nature.<sup>70</sup> And yet, there is one odd but telling inclusion among those end-products: Bacon lists 'the increasing and exalting of the intellectual parts' as one of the *magnalia* to be achieved *quoad usus humanos*.<sup>71</sup> This might seem circular if the increase of the intellectual powers were seen strictly as a means to the end-products. In contrast, it becomes an unproblematic member of the *magnalia* if the fruitfulness of inquiry and of tradition, which depends on the increase of the powers of the intellect, is understood as one of the types of the 'benefit and use' which should guide the pursuit of knowledge. I have argued here that Bacon did hold a complex notion of 'use', which he elaborated from his early to his late texts as a specification of the important idea of the ends of knowledge. Among its members are not only human welfare and practical benefit, but also the generative power of the very pursuit and transmission of knowledge, which itself depends in no small

69 Bacon, *Novum organum* I.129, OFB XI, 195–197.

70 The point is pressed by Weeks, "Role of Mechanism" 191–192.

71 *Magnalia naturae*, SEH III, 168; *Novum organum* I.87, OFB XI, 139.

measure on the rectification of the human capacities. These members have equal standing for Bacon and they are governed by his rich notion of charity. Baconian charity can be invested with this role because it is understood to have both inner and outer fruits. It is no longer an infused, theological virtue but not yet (mere) social action; instead it is the key virtue that fashions minds, inquiry, and tradition, since it is the pinnacle of a moral and, by transfer, epistemic doctrine of internal goodness ‘put in motion’.<sup>72</sup>

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## Spinoza's Ethics: "A Dominion Within a Dominion"

*Ruth Lorand*

### Summary

In his *Ethics* Spinoza attempts to base a vision of the ideal life on metaphysics. He moves from fundamental definitions, axioms, and propositions of the only existing substance (God or Nature) through determinism, naturalism, and the principle of self-preservation, to the portrait of the ideal man and his eternal happiness. I argue that Spinoza failed in this project because the attempt to ground values on metaphysics is bound to fail; different normative systems may be inferred from the same metaphysical principles. The ideal of a free man that Spinoza presents in parts IV and V of the *Ethics*, is not deduced from the previous parts; indeed, Spinoza himself agrees that ideals are mere modes of thinking. Moreover, as I show, the ideal of a free man clashes with norms that are based on the principle of self-preservation. However, this ideal bears an affinity to the notion of God, the only free and eternal substance, as presented in part I. The free man aspires to the third degree of knowledge that allows him intimate knowledge of God, through which he becomes one with God in eternal love. This affinity may support the claim that in spite of the systematic structure of the *Ethics*, Spinoza does not arrive at this ideal on the basis of his metaphysics, rather he designed his metaphysics with this ideal of man in mind.

### Introduction

Spinoza's *Ethics* is probably one of the most rigorous attempts to formulate a systematic account of the ideal, valuable life based on solid metaphysical and epistemological foundations. Spinoza attempts to show that values can be derived from a theory of Nature. If such a project were achievable, then Spinoza would be the right philosopher for the task. He had the vision and the deep conviction in the power of his method to lead to the true knowledge of Nature and, consequently, of values. His principal and final work, *Ethics*, as well as his youthful work, *A Short Treatise on God, Man and his Well-Being*, demonstrate the centrality of this project in his thinking throughout his life. Both works portray an image of the free person who comes as close as possible

to knowledge of God and thus, in a sense, becomes one with God. Spinoza concludes the *Ethics* by remarking '[i]f the way I have shown to lead to these things now seems very hard, still, it can be found'.<sup>1</sup> Evidently, Spinoza is deeply convinced that he has arrived at the true ethical knowledge, and that he is able to justify it beyond doubt as well as show the way that leads to it.

I argue that Spinoza's ideal of the free man had captured his imagination long before his metaphysics was fully constructed; this ideal motivated his inquiry into the nature of things and not the other way round. Put differently, in contrast to the logical structure of the *Ethics*, Spinoza did not arrive at his ideal as a necessary consequence of his metaphysics; rather, he constructed his metaphysics with his ideal in mind. This may explain some of the problems that occur along the seemingly logical move from metaphysics to epistemology, and from there to the nature of emotions, values based on self-preservation, and, finally, the ideal of the free man. Although Spinoza argues that humans are subjected to natural powers like all finite entities—they are not 'a dominion within a dominion'—his ideal image of free man suggests otherwise: the free man overpowers (natural) emotions and lives in eternal tranquility like God.<sup>2</sup> This affinity of the free man to God in Spinoza's *Ethics* grounds my claim that the pre-conceived idea of the free man inspired Spinoza's conception of God and in effect dictated his metaphysics and epistemological standpoint.

Spinoza's argumentation consists of multiple lines of reasoning. The notions of good and bad are defined and re-defined, serving particular purposes in their respective contexts. This gave rise to ample criticism and interpretations that oppose Spinoza's concluding declaration. Yet none of the commentators has argued that Spinoza's underlying line of thinking, beneath the apparent logical structure, develops 'backwards' from the last part to the first. Reading Spinoza this way may explain some of the central difficulties pertaining to his attempt to validate his ideal and base it on metaphysical grounds.

There are many indications, especially in the concluding chapter, that Spinoza regarded himself as a determined objectivist,<sup>3</sup> and even a deontologist. However, many read Spinoza as a subjectivist or a utilitarian relativist who bases 'good' and 'bad' on a desired satisfaction theory.<sup>4</sup> Some hold that

1 All quotations from the *Ethics* are taken from Curley's translation: Spinoza Baruch, *Ethics*, trans. E.M. Curley (London: 2005). See Pt. v, 42, Schol.

2 Spinoza, *Ethics* Pt. 3, Introduction.

3 Scruton R., *Spinoza* (Oxford: 1986) 74, for example, argues for Spinoza's objectivism.

4 See, for instance, Curley E.M., *Behind the Geometrical Method: A Reading of Spinoza's Ethics* (Princeton: 1988) 119–124; Bennett J., *A Study of Spinoza's Ethics* (Indianapolis: 1984) 292–294;



Spinoza presents two or more value theories, mainly that of the man in bondage and that of the free man.<sup>5</sup> Indeed, one could find reasonable grounds for each interpretation, if one were to attend to certain passages and marginalize others; one can find different notions of good and bad in each of the five parts and thus defend different understandings of Spinoza: as a rational egoist (influenced by Hobbes), as a utilitarian or even as a pragmatist or ethical sceptic who defines values as mere modes of thinking. However, when the *Ethics* is considered as a whole, and when Spinoza's declaration at the end of the book is taken seriously, it seems that Spinoza had one ethics in mind, one formulation of the ideal life, which he believed to be objectively good, of deontological nature rather than utilitarian, and completely justified.<sup>6</sup> The problem, as I see it, is not understanding Spinoza's final goal, but rather comprehending his rigorous attempt to necessitate it. Spinoza's devoted attempt to tie all the various notions of good and use them as stages toward the final conclusion does not work the way he intended it to work; in spite of his rigorous geometrical method driven by the deep conviction in his final goal, he leaves some loose ends and unattended problems along his enthusiastic journey.

Bennett offers a bold criticism on the whole enterprise: 'I am afraid that Spinoza fails at every step in his journey towards his collaborative morality [...]. It cannot be derived in a few short steps from basic abstract metaphysics, as Spinoza tries to do'.<sup>7</sup> According to Bennett part of the problem arises 'from his not being clear about what vision it is'.<sup>8</sup> My view is different. Spinoza, I believe, is quite clear about his vision, and boldly presents it in the fifth chapter. However, his vision is such that it is hard to imagine how it can be realized

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Delahunty R.J., *Spinoza* (London: 1985) 231; Yovel Y., *Desire and Affect: Spinoza as Psychologist* (New York: 1999) 46; LeBuffe M., "Spinoza's Summum Bonum", *Pacific Philosophical Quarterly* 83 (2005) 243; Nadler S., *Spinoza's Ethics: An Introduction* (Cambridge: 2006) 209–210, 219–220.

5 See, for example, Miller J., "Spinoza's Axiology", in Garber D. – Nadler S. (eds.), *Oxford Studies in Early Modern Philosophy* (New York: 2005) vol. 11, 149–172; Youpa A., "Spinoza's Theories of Value", *British Journal for the History of Philosophy* 18 (2010) 209–229, and LeBuffe M., "Spinoza's Normative Ethics", *Canadian Journal of Philosophy* 37 (2007) 371–392, who counts three different guidelines for action.

6 Garver E., "Spinoza and the Discovery of Morality", *History of Philosophy Quarterly* 23 (2006) 357–374, distinguishes Spinoza's ethics, as presented in the *Ethics*, from morality as presented in *Theological Political Treatise*. I argue that grains of that morality are to be found in the *Ethics* too.

7 Bennett, *Study of Spinoza's Ethics* 306.

8 Ibidem.

or how it can be based on non-evaluative grounds. I agree with Bennett that this vision (or any moral vision) cannot be based on Spinoza's metaphysics (or any metaphysics); but the problem is not, as Bennett suggested, that Spinoza attempted to achieve his goal in 'a few short steps'. My point is that the whole project is impossible, even if one takes 'many long steps'.

The *Ethics* may serve as a paradigm for understanding the inherent problems of any attempt to base ideals, or values, on metaphysics, and may teach us that the effort to validate a normative theory is self-defeating, and that this is true not only of Spinoza's *Ethics* but also of any normative theory that attempts to infer its conclusions from metaphysics.<sup>9</sup>

In what follows I analyze two principal schemes that define 'good' and 'bad' in the *Ethics*:

- (1) The struggle for self-preservation (the conatus);
- (2) The construction of an idea of man.

The first gives rise to a definition of the good as that which supports self-preservation; bad is that which interferes with, or prevents self-preservation.<sup>10</sup> The second defines the good as that which brings us closer to the ideal man—free, rational and knowledgeable man; whereas the bad is that which pushes us away from the model. Although Spinoza probably meant the former to serve as a foundation for the latter and, ultimately, had one conception of the good life, he nonetheless could not unite them into one coherent scheme.

All evaluative terms in the *Ethics* can be considered as derivatives of these two schemes. Spinoza's endeavour is to show the way that leads from basic and very general principle of self-preservation to his own ideal model. Both schemes partly justify the claim that Spinoza holds to relativism, since good and bad are defined in both cases in relation to a goal—self-preservation or achieving an idea of man. Yet, there are indications that Spinoza considered both goals good in themselves. His final destination complements knowledge of the third degree—the absolute happiness that originates in or amounts to the intimacy with Nature (or God) and the intellectual love it evokes.

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9 This standpoint coheres with Hume's criticism of the role of reason in moral evaluation. See, especially, *A Treatise of Human Nature* (Oxford: 2007) 3.1.

10 See, for instance, Spinoza, *Ethics* Pt. IV, Def. I and II.

### Self-preservation

The principle of self-preservation, the *conatus*, is introduced in Pt. III, Prop. 6: 'Each thing, as far as it can by its own power, strives to persevere in its being.' To which Spinoza then added: 'The striving by which each thing strives to persevere in its being is nothing but the actual essence of the thing.'<sup>11</sup> Note that the principle of self-preservation refers to 'everything' with no qualifications; it includes all existing individual things. Spinoza boldly repeats this idea in the *Theologico-Political Treatise*:

[I]t is the sovereign law and right of nature that each individual should endeavour to preserve itself as it is, without regard to anything but itself [...]. We do not here acknowledge any difference between mankind and other individual natural entities, nor between men endowed with reason and those to whom reason is unknown; nor between fools, madmen, and sane men.<sup>12</sup>

It should be underlined that the expression 'all individuals' includes Nature (or God) itself, that is, the principle of self-preservation applies also to God. This point is important and needs therefore to be clarified and substantiated.

To be sure, Spinoza does not say that God too endeavours to persist in his own being. This would be ridiculous since God, by definition, is eternal. However, in another context, where Spinoza defines individuals as composites of simple bodies, he writes 'if we proceed in this way to infinity, we shall easily conceive that the whole of nature is one Individual, whose parts, i.e., all bodies, vary in infinite ways, without any change of the whole Individual'.<sup>13</sup> Nature can thus be viewed as the most complex body, infinitely complex, which like all bodies adheres to the principle of self-preservation. There is, of course, an important difference between Nature and finite individuals, namely, Nature is the only individual whose existence is not and cannot be undermined by anything. Nature is the only existing substance and nothing is external to it. This point is made clear at the outset of the *Ethics*.

In principle, one can think of two ways in which an object can be destroyed: (1) from within, and (2) from without. The first is impossible for all individuals, finite as well as infinite:

<sup>11</sup> Ibidem, Pt. III, 7.

<sup>12</sup> Spinoza Baruch, *A Theologico-Political Treatise*, trans. by M. Silverthorne – J. Israel (Cambridge: 2007) XVI.

<sup>13</sup> Spinoza, *Ethics* Pt. II, Lem. 7, Schol.

[W]hile we attend only to the thing itself, and not to external causes, we shall not be able to find anything in it which can destroy it.<sup>14</sup>

Self-destruction contradicts self-preservation, and if the latter is valid then the former is impossible. This is why Spinoza writes 'that those who kill themselves are weak-minded and completely conquered by external causes contrary to their nature'.<sup>15</sup> Suicide, according to Spinoza, is not self-destruction, as the common understanding goes, but rather a failed battle with external powers. As for the second option, that is, destruction by external powers, Nature is in a different position than finite individuals. Finite individuals co-exist with other finite individuals and face powers that are external to them which may support or threaten their existence. From the perspective of each finite individual all other finite individuals may fall under one of the following evaluative categories: 'good', 'bad', or 'neutral'. Nature, by contrast, can never fail in a battle with external powers because such a battle will never take place; nothing exists outside Nature and nothing can be of any value to Nature. Self-preservation, therefore, is fully and eternally maintained by Nature as a whole, whereas finite individuals are vulnerable and bound to collapse at some point: 'There is no singular thing in nature than which there is not another more powerful and stronger. Whatever one is given, there is another more powerful by which the first can be destroyed.'<sup>16</sup> This understanding determines the main difference between Nature and finite individuals (including humans) with regard to values.

Humans evaluate objects and events as good or bad in accordance with their usefulness for self-preservation. Indeed, evaluative distinctions are made only by humans, since these are 'only modes of thinking',<sup>17</sup> but technically it can be said that all individual entities may regard other objects as 'good' or 'bad' or 'indifferent', since they all strive for self-preservation. For instance, we may say that a certain detergent is bad for silk clothes while another is good. In this general and technical sense the division between good and bad is relevant to all, and from the perspective of each individual certain things are good, others are bad or neutral: 'Music is good for one who is Melancholy, bad for one who is mourning, and neither good nor bad to one who is deaf'.<sup>18</sup>

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14 Ibidem, Pt. III, Prop. 4, Dem.

15 Ibidem, Pt. IV, Prop. 18, Schol.

16 Ibidem, Pt. IV, Axiom.

17 Ibidem, Pt. IV, Preface.

18 Ibidem, Pt. IV, Preface.

Passages like this in the *Ethics* seem to justify the claim that Spinoza endorses ethical relativism. This, however, is the result of a partial reading. Spinoza describes the common usage of evaluative terms, and argues that these are only modes of thinking, which can be misleading if one forgets their status.<sup>19</sup> Absolute good can be stated only from the perspective of the infinite individual—God or Nature; this kind of good annuls all relative and context dependent conceptions of good. This coheres with the previous observation, namely, that Nature has no evaluative distinctions. And indeed, in the concluding passages of the *Ethics* it may be seen that the free person is not concerned anymore with context-dependent evaluations. The free man, being close to God, sees everything as equally necessary and this overpowers all evaluative differentiations. I will get back to this point later on.

Nature, unlike any finite individual, cannot be described in terms of good or bad, not even in a technical or metaphorical sense. For instance, from the perspective of a finite individual, one place may be better than another and, likewise, one season is more agreeable than the other, and so on. From the perspective of God, there are no such distinctions; there is no place or time or object which is better or worse in any sense than another. This point is already presented in the Appendix to Pt. I where Spinoza describes the main issues he intends to deal with in the *Ethics*:

Nature has no end set before it, and [...] all final causes are nothing but human fictions [...] Hence, they had to form these notions, by which they explained natural things: good, evil, order, confusion, warm, cold, beauty, ugliness. And because they think themselves free, those notions have arisen: praise and blame, sin and merit.<sup>20</sup>

Nature is non-evaluative because it is not directed toward an end. The principle of self-preservation is completely and eternally accomplished by Nature, whereas finite individuals constantly struggle to achieve it.

This brings us to another aspect of individuality and self-preservation. What is it exactly that individuals as such strive to preserve? Spinoza's answer creates a difficulty within his metaphysics, on the one hand, and forms the basis for evaluative distinctions on the other. 'The foundation of virtue', Spinoza writes, 'is this very striving to preserve one's own being, and [...] happiness consists in man's being able to preserve his being'.<sup>21</sup> This clearly connects

19 Ibidem.

20 Ibidem, Pt. I, Appendix.

21 Ibidem, Pt. IV, Prop. 18, Schol.

self-preservation with virtue, but still does not answer the main question: what is this 'own being'? Spinoza provides a problematic answer: '[w]hat is common to all things [...] and is equally in the part and in the whole, does not constitute the essence of any singular thing'.<sup>22</sup> It is noteworthy that Spinoza uses a negative definition, and not a positive one like in most of his definitions. This is not a coincidence. The essence of an individual, being unique, cannot be described or determined in terms of natural laws, causality, or logical derivations, since these are common to all, or based on principles that are common to all. An individual essence is that which marks the differences between individuals and not that which unites them. This clearly poses a problem for Spinoza's metaphysics. Indeed, Spinoza states that 'God is the efficient cause, not only of the existence of things, but also of their essence'.<sup>23</sup> But while a chain of causality can be explained by general laws, individual essences cannot be thus explained. Moreover, having a unique essence creates a problematic affinity between finite individuals and the substance (God or Nature). The substance's uniqueness is absolute and need not be separated from or related to any other entity since nothing exists outside of substance. Finite individuals, by contrast, all being parts of Nature (existing in God), must completely adhere to the same principles; they share the qualities of the substance as a whole. Yet, an individual essence cannot be explained on the bases of these qualities, it cannot be reduced to them or deduced from them. Uniqueness cannot be analyzed in general terms without creating a contradiction. Unique essences must be primary beings, like the substance itself. But if it is possible to conceive of one substance only, as Spinoza believes, then the notion of individual essences poses a problem to his metaphysics.

To add to this puzzle, Spinoza remarks that '[a]ny singular thing whose nature is entirely different from ours can neither aid nor restrain our power of acting, and absolutely, no thing can be either good or evil for us, unless it has something in common with us'.<sup>24</sup> However, if God (substance) is indeed the 'efficient cause' of all individuals, they must, by definition, have some common features and they must all abide by the same laws. How can there be anything *in* Nature that is 'entirely different from ours'? The only thing that would fit this description would be another substance, but this option is inconceivable in Spinoza's metaphysics. Spinoza, to add to the confusion, remarks that 'if [...] two individuals of entirely the same nature are joined to one another, they

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22 Ibidem, Pt. II, Prop. 37.

23 Ibidem, Pt. I, Prop. 25.

24 Ibidem, Pt. IV, Prop. 29.

compose an individual twice as powerful as each one'.<sup>25</sup> Does it mean that, in contrast to the definition of individuality, it is possible to have two individuals of entirely the same nature? And if these are indeed individuals, do they not lose their individuality when unified with another individual into one body, which is stronger than both?

It may be useful at this point to compare Spinoza's notion of an individual with Leibniz' monad as presented in *The Monadology*.<sup>26</sup> This comparison starkly illustrates Spinoza's difficulty with individual essence.

The monad, just like Spinoza's individual, is distinguished from all others by its unique essence—there are no two identical monads. Unlike Spinoza's individuals, monads do not interact and do not affect each other in any way: 'The Monads have no windows, through which anything could come in or go out'.<sup>27</sup> A monad is a substance that exists in itself; it is thus eternal and—like Spinoza's conception of substance—is not subject to the principle of self-preservation. A monad or a substance is not subject to changes, it is not affected by external powers and thus its preservation is eternally ensured. Leibniz asserts that a monad is created or destroyed only by God's act of creation, which means that we cannot explain how a monad is created or destroyed.<sup>28</sup> It seems as if Leibniz took Spinoza's notion of the individual essence a step further: a unique essence that cannot be shared or based on shared principles must be a substance; Leibniz named it 'monad'.

The fact that the finite individual is *not a substance* is crucial for Spinoza's value theory since the substance (Nature or God), as we have noted, is non-evaluative. There is a strong link in Spinoza's *Ethics* between finitude and values. Only vulnerable, finite entities are in need of evaluative differentiations, in order to distinguish between that which is helpful to them and that which may harm them. Substances (or monads), however, do not face such problems and need no means for resolving them.

Leibniz was less interested in the question of happiness and virtue and more occupied with logical issues and the rationality of universal order. By contrast, Spinoza addressed head-on the true happiness of man and sought its understanding by comprehending Nature. For Spinoza, unlike Leibniz, Nature is not just the only actual substance but also the only possible one. Leibniz wished to explain why *this* world was actualized and not other possibilities, and thus

25 Ibidem, Pt. IV, Prop. 18, Schol.

26 Leibniz Gottfried Wilhelm, *The Monadology and other Philosophical Writings*, trans. R. Latta (Oxford: 1989).

27 Ibidem, §7.

28 Ibidem, §§ 6–7.



attributes evaluative considerations to God; Spinoza's God does not choose or decide between possibilities, only humans do (it is their mode of thinking). Leibniz' famous expression 'the best of all possible worlds' is an empty expression in Spinoza's metaphysics, but it is made meaningful when modified to describe humans' perspectives and choices.

If Spinoza were not devoted to the issue of true happiness and virtue, and were only interested in metaphysics, he would have paid more attention to the problem of individual essences. He would have realized that this problem cracks his unified, deterministic world where future events are completely derived from past events. Unique essences cannot be derived from anything without losing their uniqueness. But without their unique essences, individuals (humans in particular) would not be able to relate to evaluative differences and would not face the problem of preserving their existence as individuals.

This point is of great importance in Spinoza's axiology and is worthy of further discussion. Spinoza holds that differences between individuals generate the major cause of the battle for survival. If we were to live in a unified world where all individuals consist of the same essence, there would be no conflict between individuals (although it would create a logical problem of distinguishing between these individuals). Spinoza expresses this idea when he asserts that

to man, there is nothing more useful than man. Man, I say, can wish for nothing more helpful to the preservation of his being than that all should so agree in all things that the Minds and Bodies of all would compose, as it were, one Mind and one Body; that all should strive together, as far as they can, to preserve their being; and that all, together, should seek for themselves the common advantage of all.<sup>29</sup>

In a unified world, or a unified society for that matter, there are no conflicts of interest and the power of all individuals is thus increased. This is the main point of Hobbes's *Leviathan*. A society that does not allow individual differences among its members to dictate their social conduct is a strong society that can better fight external hostile powers. Now if we take this scheme and expand it to the whole universe, then all the problems of self-preservation would entirely disappear. This is indeed the case of Nature as a unified entity that is constantly preserved. Individuality creates and defines the problem; unification solves it by sacrificing individuality.

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<sup>29</sup> Spinoza, *Ethics* Pt. IV, Prop. 18, Schol.



Spinoza repeatedly emphasizes the benefit of eliminating or minimizing individual differences. For another instance: 'Insofar as a thing agrees with our nature, it is necessarily good'.<sup>30</sup> And Spinoza adds:

There is no singular thing in Nature that is more useful to man than a man who lives according to the guidance of reason. For what is most useful to man is what most agrees with his nature [...]. But a man acts entirely from the laws of his own nature when he lives according to the guidance of reason [...] and only to that extent must he always agree with the nature of the other man.<sup>31</sup>

This claim asserts two things: (1) it confirms the idea that similarities among individuals are useful for their self-preservation; in this case it is the ideal society of those who live in obedience to reason; and (2) it deviates from the understanding that self-preservation concerns the preservation of *individual essences*. It replaces individuality with obedience to reason, because the latter is necessarily in harmony with all individuals and expresses loyalty to one's own nature. But it is not clear what is left of the individual nature if all human individuals benefit from the same obedience to reason. Reason is one and common to all and thus eliminates or oppresses individual differences. This can be clearly seen in Spinoza's comment on animals:

The law against killing animals is based more on empty superstition and unmanly compassion than sound reason. The rational principle of seeking our own advantage teaches us the necessity of joining with men, but not with the lower animals, or with things whose nature is different from human nature.<sup>32</sup>

Surely one can think of many properties humans share with animals. Spinoza's statement that animals are of a different nature is in disagreement with his own claim that humans should not be considered as 'a dominion within a dominion' since humans are natural entities like any others.<sup>33</sup> Yet, when it comes to ethics Spinoza does regard humans as being a 'dominion within a dominion', elevated from all other creatures by rationality.

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<sup>30</sup> Ibidem, Pt. IV, Prop. 31.

<sup>31</sup> Ibidem, Pt. IV, Prop. 35, Cor. 1.

<sup>32</sup> Ibidem, Pt. IV, Prop. 37, Schol. 1.

<sup>33</sup> Ibidem, Pt. III, Preface.

Individual differences are strongly expressed through emotions—the more one is attentive to one's emotions, the fewer similarities with others can be found. Different people react differently to the same object, but they do not differ, so Spinoza believes, when it comes to reason. The centrality of the individual essence in the scheme of self-preservation is thus replaced by the centrality of reason. All humans, so it may be concluded, share the same essence as long as they restrain their emotions. This conclusion clearly contrasts with the former definition of individuality as that which is not shared by an individual with any other individual. By elevating reason to the highest value and undermining individuality, Spinoza turns a central (though problematic) concept in his theory—individual essences—into a marginal element that is overpowered by reason.

The idea that each individual strives to preserve its own existence as an individual may have led Spinoza to relativism, and to a denial of the necessarily objective, common values. To choose the relativist path would mean that no evaluative judgements are passed upon the nature of the individual essences themselves and that no individual is truly better or worse in any sense than another. This coheres with the non-evaluative standpoint of God. Moreover, individuals, as such, are incomparable. Yet, while individuality in itself is not subjected to normative judgment it functions as the criterion for defining what is good and what is bad. Thus, each individual is justified in preserving its own essence whatever its nature may be. 'Good' and 'bad' would be then whatever supports or prevents the preservation of a particular individual; whatever is good for X may be bad for Y and so forth without any further conclusions and without the need to construct a high ideal of the objective good life. The very idea of a high ideal would be incoherent with this kind of subjectivism or relativism. The emotional, ignorant person would be justified in preserving his or her flimsy character by the same reasons that Spinoza would be justified in preserving his own.

Spinoza provides some grounds for this possibility:

For although human bodies agree in many things, they still differ in very many. And for that reason what seems good to one, seems bad to another; what seems ordered to one, seems confused to another; what seems pleasing to one, seems displeasing to another, and so on.<sup>34</sup>

While it may seem that each individual is equally justified in doing whatever is good for him or her, Pt. IV and Pt. V of the *Ethics* present a different view and

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34 Ibidem, Pt. I, Appendix.

suggest essential features of an idea of man, a model of the ultimate good and truly happy man.

### An Idea of Man

Although self-preservation is the 'foundation of virtue'<sup>35</sup> it may lead to subjectivism or relativism, and this is entirely in contrast to Spinoza's intentions. The ideal form of life that cannot be directly based on the principle of self-preservation motivates Spinoza to introduce in Pt. IV a new concept: 'an idea of man'. Spinoza admits that having such an idea, or 'model' (as he calls this idea), does not cohere with the course of Nature. Nothing in nature is perfect or imperfect; there are no models or paradigms in Nature, nor plans or ends to accomplish:

For we have shown in the Appendix of Part I, that Nature does nothing on account of an end. That eternal and infinite being we call God, or Nature, acts from the same necessity from which he exists [...]. As he exists for the sake of no end, he also acts for the sake of no end. [...] What is called a final cause is nothing but a human appetite insofar as it is considered as a principle, or primary cause, of some thing.<sup>36</sup>

Ideas, models, or paradigms are (inadequate) modes of thinking that can be useful not for understanding Nature, but for the ethical project, which, in a sense, is alien to Nature: 'For because we desire to form an idea of man, as a model of human nature which we may look to, it will be useful to us to retain these same words with the meaning I have indicated'.<sup>37</sup> Spinoza adopts this mode of thinking for its usefulness in promoting the idea of a free man, in spite of the admitted inadequacy to Nature. At the same time he ignores the fact that this mode of thinking does not comply with his previous notion of individuality. Each individual, so to speak, is its own model, just like Nature as a whole is its own model; individuality is not constructed according to an idea.

How can Spinoza bridge this gap and justify the move from individuality to an idea of man? I can suggest one way of justifying Spinoza without, however, eliminating all inherent difficulties. The justification is based on the value of cognition or knowledge as a means for self-preservation. Each individual

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35 Ibidem, Pt. IV, Prop. 18, Schol.

36 Ibidem, Pt. IV, Preface.

37 Ibidem, Pt. IV, Preface.

needs to be aware of its own nature ('know thyself') as well as of Nature as a whole in order to distinguish between what is truly useful for its survival and what is harmful.<sup>38</sup> A desire to survive is not enough. In Pt. III Spinoza shows how misconceptions regarding what is truly useful or harmful are formed. A brief summary of the conclusions of Spinoza's analysis of emotions would be that emotions mislead us (even if not always) in identifying what is good and what is bad for us because they operate through associations and irrelevant similarities. Emotions deviate us from the original cause of self-preservation and create false motivations for actions. Instead we should, as much as we can, attain true knowledge of our situation and act upon it. However, true knowledge of what is good or bad in certain situations demands a comprehensive understanding of Nature. This requirement seems to justify the reference to humans as a kind; humans are epistemologically superior to other creatures and are able to obtain useful knowledge of supportive and destructive powers. It follows: (1) that an individual who knows everything that is required for taking right action will be successfully preserved; (2) living in an organized society, sharing knowledge and efforts to improve the conditions of life, is of higher value than living in isolation and maintaining the natural right to act in any way one wishes (as in Hobbes's *Leviathan*).

Both points that seem to justify Spinoza's move from individuality to an 'idea of man' raise problems:

### 1 *Complete and Partial Knowledge*

Under certain circumstances anything may become destructive or constructive, and one cannot generally state the value of things. The metaphysical or even scientific understanding of Nature is not sufficiently useful because it is general.<sup>39</sup> One has to know in precise terms every relevant detail; in the last analysis, all details of the universe are relevant for fully understanding one event. Moreover, knowledge of God (Nature) is not a mere general knowledge: 'The more we understand singular things, the more we understand God'.<sup>40</sup> Thus knowledge of God includes knowledge of all individual entities. Such knowledge is unlikely to be complete. It is not enough to know, for instance, the qualities of a certain fruit in order to calculate its value for a certain person in a given context. Many elements may play supportive or destructive roles with regard to a particular circumstance, and it is impossible to know them all. Spinoza admits this limitation:

38 For similar observations, see Youpa, "Spinoza's Theories of Value" 219–220.

39 Spinoza, *Ethics* Pt. III, Prop. 50.

40 Ibidem, Pt. v, Prop. 24.

[W]e can have only a quite inadequate knowledge of the duration of things [...] and we determine their times of existing only by the imagination [...]. That is why the true knowledge we have of good and evil is only abstract, or universal, and the judgment we make concerning the order of things and the connection of causes, so that we may be able to determine what in the present is good or evil for us, is imaginary, rather than real.<sup>41</sup>

To know the exact worth of a certain object or action demands full knowledge of the whole chain of events, which is impossible to attain. We may be lucky in doing the right things for the wrong reasons, or unlucky doing what seems to be the right thing, based on partial knowledge, and achieve the wrong results. The argument for the usefulness of knowledge and, consequently, the usefulness of obedience to reason, is not as strong as it may seem. Spinoza admits that 'human power is very limited and infinitely surpassed by the power of external causes. So we do not have an absolute power to adapt things outside us to our use'.<sup>42</sup>

Knowledge and submission to reason gradually lose their initial utilitarian nature, and become, mainly in Pt. v, absolutely desirable ends. Obedience to reason acquires a deontological status and this is clearly manifested when such obedience endangers self-preservation itself.<sup>43</sup> Garver argues that morality is discovered in the *Theological-Political-Treatise*, whereas the *Ethics* is only about the intellectual love of God.<sup>44</sup> This is not entirely accurate. There are grains of moral imperatives in the *Ethics*. Curley notes that Spinoza's prescriptions are 'hypothetical imperatives with necessary antecedents, and so in effect, categorical'.<sup>45</sup> Miller distinguishes between what is 'noncircumstantially relatively valuable', and values that are circumstantial in Spinoza's ethics.<sup>46</sup> The former is valued independently of circumstances although it is relative to human nature. Knowledge is valued independently of particular circumstances, whereas an object like a tree can be of a different value in different circumstances. However, although Miller has a point, that is, certain prescriptions and values seem to depend on circumstances, I agree with Curley that, in the last analysis, all values pertain to the principle of self-preservation, which

41 Ibidem, Pt. IV, Prop. 52, Schol.

42 Ibidem, Pt. IV, Appendix, xxxii.

43 See, for instance, ibidem, Pt. IV, Prop. 72 and its Demo.

44 Garver, "Spinoza and the Discovery of Morality" 357.

45 Curley E., "Spinoza's Moral Philosophy", in Grene E. (ed.), *Spinoza, a Collection of Critical Essays* (New York: 1973) 371.

46 Miller, "Spinoza's Axiology" 150.

is not circumstantial. Self-preservation is necessarily true for every individual; it is a natural instinct, which turns into a moral duty for humans. Although the fulfillment of this moral duty depends on circumstances, the duty itself does not. We must always act upon this duty, although we might fail occasionally: 'We shall bear with an equal mind all that happens to us in contravention to the claims of our own advantage, so long as we are conscious, that we have done our duty, and that the power which we possess is not sufficient to enable us to protect ourselves completely'.<sup>47</sup> In Pt. v it becomes clear that the value of knowledge or understanding Nature is not in solving this or that particular problem of preservation, but rather in merely understanding the necessity of events, come what may: '[t]he greatest striving of the Mind, and its greatest virtue is understanding things by the third kind of knowledge'.<sup>48</sup> We should bear in mind that Spinoza had already written that 'the foundation of virtue is this very striving to preserve one's own being, and that happiness consists in man's being able to preserve his being'.<sup>49</sup> What seemed to be previously a means of preservation—knowledge—becomes the end in itself:

[T]his striving of the Mind, by which the Mind, insofar as it reasons, strives to preserve its being, is nothing but understanding [...] this striving for understanding [...] is the first and only foundation of virtue, nor do we strive to understand things for the sake of some end [...]. On the contrary, the Mind, insofar as it reasons, cannot conceive anything to be good for itself except what leads to understanding.<sup>50</sup>

This move from the preservation of individual essences to understanding is definitely not straightforward. Understanding is not an expression of individuality, since true knowledge and understanding are the same for all. Knowledge of the second kind is gradual and progressive, and thus allows individual differences with regard to the hierarchy of knowledge; not so knowledge of the third kind.

Once knowledge of the third kind is arrived at there are no further stages; it is an immediate, intimate acquaintance with Nature, which cannot serve as a means for preservation but is rather an end in itself. Although the intimate understanding of God is such that every particular detail can be understood by

47 Spinoza, *Ethics* Pt. iv, Appendix xxxii.

48 Ibidem, Pt. v, Prop. 25.

49 Ibidem, Pt. iv, Prop. 18, Schol.

50 Ibidem, Pt. iv, Prop. 26, Demo.

it, and in principle deduced from it, it does not mean that the man who arrived at this knowledge is indeed capable of viewing the whole chain of events for his advantage. 'The whole,' so Spinoza tells us, 'is greater than its part'.<sup>51</sup>

Spinoza's ideal man is not a highly pragmatic and successful person in terms of wealth, health, security and longevity. Spinoza himself is certainly not the role model of such a person. The ideal, free man is a person who finds the highest pleasure merely in obtaining knowledge of the third degree and not in its usefulness.

## 2 *Society and the Free Person*

An organized society allows the sharing and increasing of knowledge and mutual aid. Yet this life form requires the sacrifice of some aspects of individuality and acceptance of some degree of uniformity; it demands obedience to state laws and social norms, even when these are inconsistent with the 'idea of man' that Spinoza advocates. A similar problem arises in Hobbes's *Leviathan*. The Leviathan is an individual (the state) that is constructed of individuals (the citizens). Focus is shifted thereby from the essential essence of each citizen to that of the more complex individual, that is, the state. Both Hobbes and Spinoza favour what they regard as obedience to reason, and recommend the sacrifice of the individual good for the preservation of the state. This is clearly manifested in the dilemma of the free man who 'always acts honestly, not deceptively', even if he can save his life by deception.<sup>52</sup>

Living in actual, not ideal, society forces the co-existence of the free person with the ignorant. The free man is thus forced to attend to details that otherwise would not concern him and adopt a double standard of behaviour. For instance, humility and repentance are not virtues for the wise, but 'since men must sin, they ought rather to sin in that direction'.<sup>53</sup> The ignorant, however inferior, is still human and can be helpful when needed, and for this reason deserves respect and consideration. Indeed, the dependence on the mob's favors should be limited to the necessary minimum, yet the wise need not completely refrain from their company and their help: 'we must be careful in declining favors, so that we do not seem to disdain them, or out of Greed to be afraid of repayment. For in that way, in the very act of avoiding their Hate, we would incur it. So in declining favors we must take account both of what

51 Ibidem, Pt. IV, Prop. 18, Schol.

52 Ibidem, Pt. IV, Prop. 72.

53 Ibidem, Pt. IV, Prop. 54, Schol.

is useful and of what is honorable'.<sup>54</sup> Note that the reason given in this passage is both of utilitarian and deontological nature. It may seem that Spinoza offers a double ethics: (1) that of the free among themselves; (2) that of the free men towards the mob. This, however, is not the case. The free man considers the mob differently because they are different; it is useless to regard the mob by the standards of the free man. Differences in nature require differences in consideration and behaviour within the same ethics.

In an ideal society of rational, free people, all individual differences are eliminated or rendered inconsequential because they all obey reason and aim at the same thing. Ignorant people, by contrast, maintain their individuality since they are not unified by reason. Individual differences become a burden, a hurdle on the way to complete freedom and happiness. Individuality has then two contrasting aspects: it provides reasons for action and for creating a protective society and, at the same time, it is an obstacle to the functioning of society. Free persons, among themselves, do not need a state in order to guarantee orderly life. They only submit to state laws and social norms because they do not live in the ideal world. So, again, this is not a different ethics but a derivative from the ethics of the idea of man.

As a citizen in the actual state the free man exercises a utilitarian system. As a free man he strives towards the metaphysical ideal and the renunciation of good and bad: desiring nothing, wanting nothing, free of external constraints in an eternal tranquility like God: 'If men were born free, they would form no concept of good and evil so long as they remained free'.<sup>55</sup> Spinoza presents the achievement of knowledge of the third kind as the ultimate resolution of all differences and contradictions. At this stage all evaluative differentiations are dissolved, including the difference between knowledge of Nature and self-knowledge, and between being a free individual and being a member of a non-ideal society. The free, knowledgeable person's ultimate happiness is independent of particular circumstances. At this stage, paradoxically, the principle that initiated the construction of ethics is dissolved too: the gap between the finite individual and infinite substance is harmonized. It follows then that the free, ideal man lives in eternity: 'the wise man [...], is hardly troubled in spirit, but being, by a certain eternal necessity, conscious of himself, and of God, and of things, he never ceases to be, but always possesses true peace of mind'.<sup>56</sup> How can a finite being defeat finitude? Spinoza believes that understanding

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54 Ibidem, Pt. IV, Prop. 70, Schol.

55 Ibidem, Pt. IV, Prop. 68.

56 Ibidem, Pt. V, Prop. 42, Schol.



the necessary course of nature is the remedy for the fear of death: 'A free man thinks of nothing less than of death, and his wisdom is a meditation on life, not on death'.<sup>57</sup> It can be clearly seen how this leads to undermining the self-preservation principle: if the free man does not think of death, or any unpleasant forces of life, how can he maintain self-preservation? Spinoza argues that the notions of good and bad are interdependent—having one necessitates the other: 'he who is born free, and remains free, has only adequate ideas, and so has no concept of evil [...]. And since good and evil are correlates, he also has no concept of good'.<sup>58</sup> We can similarly argue that the notions of life and death are correlates.

Knowledge and awareness of destructive forces are a necessary step towards fighting them and fulfilling the free man's duty. Was not this the purpose of knowledge in the first place? However, a person who lives in eternity and does not think of death is unlikely to do anything about living or dying. Spinoza's remark on the difference between the sick and the healthy person adds to this puzzlement: 'The sick man, from timidity regarding death, eats what he is repelled by, whereas the healthy man enjoys his food, and in this way enjoys life better than if he feared death, and directly desired to avoid it'.<sup>59</sup> The sick man needs to sacrifice the pleasure of food in order to maintain his health, but is this not the situation of all finite entities? In the constant fight for self-preservation even the healthy man has to pay attention to his food. Eating and drinking happily without consideration of dangers sounds more like a fool's illusory paradise than a rational reality. Spinoza provides in Pt. IV norms of behaviour in ignorant society in order to maintain harmonious life. Is it possible, then, that the free man who is cautious when it comes to social and political issues, disregards his health on the account of eternity?

The tension between the two tendencies cannot be resolved. The idea of free man suggests that worries are obstacles to true and eternal happiness. The principle of self-preservation demands attention to all kinds of destructive powers. This principle cannot be accomplished without having in mind that even the free man is actually finite. Indeed, living in eternity eliminates worries concerning health but also annuls the need for social order and political considerations.

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57 Ibidem, Pt. IV, Prop. 67.

58 Ibidem, Pt. IV, Prop. 68, Demo.

59 Ibidem, Pt. IV, Prop. 62, Schol.

## Conclusion

Spinoza had one ethics in mind, which he attempted to found on his metaphysics. However, his metaphysics allows different evaluative systems. If Spinoza were to accept two or three schemes of ethics or be a genuine relativist, as some of Spinoza's interpreters suggest, then other major problems would have arisen.<sup>60</sup> For one, it would have been impossible to account for Pt. v and the concluding proposition of the *Ethics*. I have tried to show that, although no direct path leads from Pt. I to Pt. v, Spinoza admirably attempted to find such a path. I have also tried to show that this is not an unfinished project on Spinoza's part; rather, it is an impossible project. The idea of man is not grounded in Spinoza's metaphysics, and cannot be proven by it.

Yet, there is another strong tie between the first and the last parts of the *Ethics*: the idea of a free man astonishingly resembles the portrayal of God in Pt. I; this affinity unifies Spinoza's theory. It connects the beginning and the end not by a deductive procedure but rather by an image of God that is adopted by man as a model (or, perhaps, the other way round). The ideal man is free (almost) like God; lives according to his own nature (almost) like God; loves himself in a non-emotional way; regards evaluative distinctions only as modes of thinking, and like God he does not view Nature in evaluative terms but rather in terms of absolute necessity. The ideal man, like God, is free of external constraints and lives according to his own nature (reason); like God, he is self-content and lives, as it were, in eternity. The utilitarian and relative elements that partake in the ethical scheme are only means, rungs to reach the final goal—to become truly free and be one with Nature. Indeed, Spinoza's metaphysics does not validate his ethics, but rather furnishes and designs the images of the ultimate good and the idea of man.

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60 See notes 4–7.

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# What was Kant's Critical Philosophy Critical of?

*Catherine Wilson*

## Summary

While P.F. Strawson saw in Kant's enterprise a form of 'descriptive' as opposed to 'revisionary' metaphysics, and while most historians of philosophy regard Kant as aiming to settle the foundations of physics and to explain the mind's contribution to experience, Kant's own account of his project is very different. His aim—the defeat of materialism, atheism, and fatalism—as stated in the *Prolegomena to any Future Metaphysics*, is frankly revisionary, and joins metaphysics to morals. Here I present evidence that Kant's overarching aim was not epistemological description, but the rejection of the physical, moral, and historical outlook of his Enlightenment contemporaries.

An ideology, in the classic formulation of Karl Mannheim, is an account constructed by the dominant intelligentsia of a society that obscures certain facts about reality in order to maintain their privileged condition. Utopian thinking, by contrast, is fantasy that reflects the aspirations of a rising, aspiring class.<sup>1</sup> Taken more generally the term ideology has come to refer to descriptions and explanations—theories of how the world works—that underwrite normative ideals of a controversial type.

The history of metaphysics, as well as the history of science, is fertile ground for the study of ideologies and utopias. Both metaphysical and empirical generalizations, such as Aristotle's form-matter distinction, or Hobbes's theory of boundless human desires, suggest inexorable constraints or irresistible affordances and offer grounds for certain political arrangements or adherence to particular moral norms. At the same time, because ideologies by definition obscure the motives that give rise to them, the link between seemingly objective descriptive content and practical and justificatory aims may not be as evident as it is in the case of Aristotle's metaphysical defense of slavery or Hobbes's psychological grounding of autocracy.

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1 See Mannheim K., *Ideology and Utopia*, trans. L. Worth – E. Shils (New York: 1936 [1929]) 36.

The ideological content of Kant's critical philosophy furnishes a case in point. Kant's overarching philosophical ambition is stated clearly in the *Prolegomena*. It is the recovery and application, in purified form, of the 'transcendental Ideas' which, he says, 'if they do not positively instruct us, nevertheless remove the crude and reason-limiting doctrines of materialism, naturalism, and fatalism, and thereby [...] bring the ideas of morality out of the realm of speculation'.<sup>2</sup> Yet most general accounts of Kant's project, including the most authoritative, seem to veer to the side of this statement. Perhaps because of the propensity to regard Kant, to a degree that is exceptional for historical figures, as having something to say 'to us', particularly in moral philosophy, Kant's own statement of what he is up to is discounted or replaced by a more constructive, less negative account. For example: Michael Rohlf says,

Kant's main goal is to show that a critique of reason by reason itself, unaided and unrestrained by traditional authorities, establishes a secure and consistent basis for both Newtonian science and traditional morality and religion. In other words, free rational inquiry adequately supports all of these essential human interests and shows them to be mutually consistent. So reason deserves the sovereignty attributed to it by the Enlightenment.<sup>3</sup>

And Paul Guyer states in his Introduction to the Cambridge edition of the *Critique of Pure Reason*, referencing Wolff and Baumgarten as dogmatists and Locke and Hume as empiricists, that 'Kant attempted to lay the foundations both for the certainty of modern science and for the possibility of human freedom'.<sup>4</sup> In a frequent form of exposition, Kant is described as seeking a compromise between the rationalist position that truths about God, the soul, and the world can be derived by analysis and reflection and the empiricist position that all knowledge is derived from sensory experience and reflection on it. He

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2 Kant Immanuel, *Prolegomena zu einer jeden künftigen Metaphysik*, AA IV, 363. AA references are to Kant Immanuel, *Gesammelte Schriften*, ed. Akademie der Wissenschaften, (Berlin: 1902–). References to the *Critique of Pure Reason* (volumes III [2nd B ed. 1787] and IV [1st A ed. 1781] of AA) are given in the usual A/B format; longer quotations are taken from the English translation: Kant Immanuel, *Critique of Pure Reason*, trans. and ed. N.K. Smith (New York: 1929).

3 Rohlf M., "Kant", *Stanford Encyclopedia of Philosophy*, URL = <<http://plato.stanford.edu/entries/kant/>>.

4 Guyer P., "Introduction", in Kant Immanuel, *Critique of Pure Reason* (Cambridge: 1998) 2.

is said to agree with the empiricists that some traditional philosophical questions about immortality, free will, and the nature of substance are experience-transcendent, but to side with the rationalists on personhood as distinct from situation and character, the active powers of the mind, and freedom of the will which underwrite his theory of moral obligation and the universalization criterion.

Such interpretive claims merit no direct challenge. They are true as far as they go. But they need serious qualification. Further, the philosophical anxiety that I believe motivated Kant so powerfully has been expunged from them. By way of adjustment, I want to argue for an interpretation of Kant's project that highlights his anti-scientism, his rigorism, and his teleological view of history. In these regards, I think Kant does *not* have something to say to us, for these commitments led him to reject—and later moral and political philosophy to follow him in this respect—some of the more progressive currents of Enlightenment philosophy. The rival thumbnail version of the critical philosophy that I advocate could be expressed as follows:

Kant attempted to show that the Newtonian science of matter and motion was not a representation of ultimate reality. His main goal was to show that it was appropriate to place rigorous moral demands upon human beings, insofar as they were not ruled by the blind mechanisms of Nature. He wished to lay the foundations for the conviction that the world was evolving through the operation of immanent nonmechanical forces towards a better state of culture, rather than running down, as some Newtonians suspected, to chaos and dust.

Kant's teachings on the 'bounds of sense' are in other words closely related to his not only traditional but (by late eighteenth century philosophical standards) somewhat conservative moral and political views.

In advancing this interpretation, I take issue with P.F. Strawson's distinction between descriptive and revisionary metaphysics and his associated claim that the *Critique of Pure Reason* is an exercise in descriptive metaphysics.<sup>5</sup> Descriptive metaphysics, in Strawson's view, uncovers the underlying structure of the actual world and the observer's relation to it. Revisionary metaphysics, as he characterized the systems of certain of Kant's predecessors, substitutes for an accurate image of the world, a picture that is aesthetically, morally, emotionally, or intellectually preferable. Kant, Strawson believed, sought to extract

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5 Strawson P.F., *Individuals* (London: 1959) Introduction, and Strawson P.F., *The Bounds of Sense: An Essay in Descriptive Metaphysics* (London: 1966).

the actual underlying conditions of empirical experience—the provision of a spatio-temporal structure, the apprehension of causal relations, the ability to recognize objects as being objects of a certain type and to reidentify them—rather than giving the reader an alternative to the world of ordinary experience as Berkeley's (despite his claim to be following common sense) and Leibniz's systems appear to do. The enterprise was philosophical rather than psychological, Strawson thought, because Kant was concerned with the necessary conditions of all possible experience, which might well take nonhuman forms, and because he drew on the existing tradition in epistemology and metaphysics.

Indeed, Kant's language throughout most, though not all, of the First Critique is dry, abstract, and unemotional, as though Kant were indeed giving the reader a scientific metaphysics rather than a philosophical romance. His diction there contrasts with the flowery style of many of his precritical works, including the *Universal Natural History*, the style that earned Kant the title of the 'beautiful Magister' early in his lecturing career.<sup>6</sup> Against Strawson, however, I would maintain that all metaphysical systems—accounts of the unobservable that are not derived by the experimental and mathematical methods of the special sciences—are revisionary. The dry and technical analysis and deduction of the First Critique was an element of a rhetorical strategy for a project that was emotional and reactive. Kant wanted ultimately to produce a 'metaphysics of nature'<sup>7</sup> which, together with his metaphysics of morals, would furnish a complete system of philosophy, theoretical and practical. This system would provide the world of letters with a rigorously established and comprehensive alternative to the theory of man as an exquisitely sensitive and complex machine, but nevertheless a machine without a soul, and to the fragmented, relativistic, observational anthropology, and fierce theological-political critique of Kant's contemporaries and near contemporaries in France, Scotland, and Germany.

Kant owned few French and no English books and probably could not read these languages fluently. This limitation perhaps explains why there is virtu-

6 For example, 'Bei der allgemeinen Stille der Natur und der Ruhe der Sinne redet das verborgene Erkenntnißvermögen des unsterblichen Geistes eine unnennbare Sprache und giebt unausgewickelte Begriffe, die sich wohl empfinden, aber nicht beschreiben lassen'—*Allgemeine Naturgeschichte* AA I, 367.

7 The Preface to the first edition (1781) promises a speculative "Metaphysik der Natur" (A xxi) as does the second (1787) (B xliii). It is briefly referred to in the *Metaphysische Anfangsgründe der Naturwissenschaft* (1786), with which it is clearly not identical, as furnishing the transcendental portion of natural philosophy and psychology and as parallel to the Metaphysics of Morals. It is arguably the subject of the *Opus Postumum*.

ally no scholarship on Kant and English and French critical philosophy that is not strictly comparative by contrast with the rich and deep commentary on Kant's relationship to the tradition of eighteenth century Latin and German school metaphysics in which he was fully immersed. But it would be wrong to suppose that Kant was not responding to French critical philosophy, with a non-scholastic critique of his own. The Germans were prompt and effective translators and thorough and impartial book reviewers who had ready access to texts that were proscribed by the French authorities,<sup>8</sup> and there was a sophisticated culture of reviewing of books on theology, medicine, philosophy, anthropology, and the natural sciences in the *Teutsche Merkur*, the *Frankfurter Gelehrte Anzeigen*, and the *Göttingische Gelehrte Anzeigen*. Kant owned copies of Helvetius's *De l'esprit* in German and of J-R Robinet's *Système de la nature*, the principal specimens of French materialist epistemology and nature philosophy respectively. He refers to the hylozoism of Maupertuis, and he knew Rousseau's primitivist writings as well as his *Social Contract*.

# 1

These 'other critical philosophers', as I shall call them, were united in their rejection of a providential universe and orthodox Catholic or Protestant theology, and in their professed admiration for Nature. They drew on a range of theoretical resources, including Cartesian physiology, Leibnizian psychology, Hobbesian social theory, Lockean critical philosophy, Spinozistic monism, and Baconian experimentalism, as well as Lucretian theology-critique. By and large, they considered the human species as another animal species, though one endowed with certain distinctive characteristics, including language, culture, and upright posture. They developed the Cartesian tradition of medical materialism, ignoring the Cartesian incorporeal soul. They emphasized the sensibility and sensitivity of the animal machine, positing unknown forces or a material substrate to account for thought and feeling, and they tried to understand morality as a set of customs emerging from social interaction that could differ from culture to culture rather than as a set of divine ordinances. According to Hume, for example, morality is whatever form of behaviour supports human co-operation and makes people useful and agreeable to one

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8 Such works included the texts of La Mettrie, Helvetius, Shaftesbury, Hume, Voltaire, Rousseau, Diderot, and Montesquieu as well as minor works of anthropology, politics, and philosophy, and salacious or merely gallant literature. See Darnton R., *The Forbidden Bestsellers of Pre-Revolutionary France* (New York: 1996).



another.<sup>9</sup> Habit, custom, and the passions direct human life more forcefully and more productively than do logic and reasoning. Belief in the substantiality and immortality of an incorporeal soul and rewards and punishments in the hereafter is superstition.

War, for the Comte de Buffon, Adam Smith, and Denis Diderot, was a pathology, and social hierarchies, for Rousseau, were contingent arrangements that had emerged as a result of technological development from a state of primitive simplicity and equality.<sup>10</sup> What Philip Sloan calls 'Enlightenment pessimism'<sup>11</sup> along with the more familiar 'Enlightenment optimism', was characteristic of these figures, insofar as they ridiculed and rejected or simply doubted the image of the world as created, protected, and supervised by God, emphasizing the cruelties of man to man and the horrors inspired by religious superstition. Kant's own wayward pupil, J.G. Herder, was closer in spirit and sentiment to the *philosophes* and the Scottish students of the evolution of society, and this was a source of the friction so significant for Kant's own philosophical development.<sup>12</sup> Taken to extremes, naturalism issued in the libertinism of La Mettrie, and the insistence on the part of the Baron Holbach (likely assisted by Diderot, who also collaborated with Rousseau) that Christianity was a destructive superstition and that man was devoid of free will, and entirely subject to nature's laws.<sup>13</sup> Holbach repelled or alarmed many, including members of the French clergy, Voltaire, Frederick the Great, and Johann von Goethe.

Buffon, one of the most popular writers of the eighteenth century, posed and answered a series of questions in his multi-volume *Histoire Naturelle* that also challenged and worried many of his readers. He devoted a long chapter to the anatomical similarities between ape and man, conceding a soul to humans, but in effect regarding the human being as an ape with somewhat different attributes, and hinting consistently at a purely natural and epigenetic origin for life and for the cosmos. Regarded by Charles Darwin as the first to put transformism on a scientific footing, Buffon speculated that all living

9 See Hume David, *An Enquiry Concerning the Principles of Morals*, ed. T.L. Beauchamp (Oxford: 1998 [1751]), esp. Sect. 5.

10 Rousseau Jean-Jacques, *Discours sur l'origine et les fondements de l'inégalité parmi les hommes*, ed. J. Roger (Paris: 1971 [1755]).

11 Sloan P.R., "Introduction to the Second Discourse and Proof of the Theory of the Earth from the *Histoire Naturelle* (1749)", in Lyons J. – Sloan P.R. (eds.), *From Natural History to the History of Nature* (Notre Dame – London: 1981) 132.

12 See Zammito J., *Kant, Herder, and the Birth of Anthropology* (Chicago: 2002).

13 Thiry Paul-Henri, Baron, d'Holbach, *Christianisme dévoilé* (1761); *La Contagion sacrée* (1768); *Système de la Nature ou Des Loix du Monde Physique et du Monde Moral* (1770). See Kors A.C., *D'Holbach's Coterie: An Enlightenment in Paris* (Princeton: 1976).

things might have emerged from a single ancestor by differentiation and modification. Evidence of extinction forced him to ponder the eventual fate of the human race. The excavation of buried cities and the bones of extinct animals dug up from pits indicated that humanity too might simply go out of existence one day, a victim of its own sanguinary habits, which Buffon deplored:

Incited by insatiable avarice or blind ambition, which is still more insatiable, [man] becomes callous to the feelings of humanity, [...] His whole thoughts turn upon the destruction of his own species, which he soon accomplishes. The days of blood and carnage over, [...] he beholds with a melancholy eye, the earth desolated, the arts buried, nations dispersed, an enfeebled people, the ruins of his own happiness, and the loss of his real power.<sup>14</sup>

Buffon considered nature as a collection of eternal indestructible particles, some organic and others inorganic, which aggregated temporarily into living things and physical objects then decomposed into their constituent atoms. Nature was a succession of geological stages, history was a succession of events, and the world a collection of peoples who had each adopted their own morals and customs as they had adopted different styles of dress and adornment.

## 2

Although his library was better stocked with metaphysics than with natural history, Kant did not begin his career as a dogmatic metaphysician, and the critical turn of 1769–1771 was not only a turn away from German school metaphysics. Rather, Kant began his philosophical career in the early 1750s as a student of nature, a critic of Leibniz and Wolff, and a proponent of the view that mathematical methods of demonstration were inappropriate in metaphysics. He was also inclined to the sentimental view of ethics of the English philosophers Hutcheson and Shaftesbury.<sup>15</sup> The frothy, rather frivolous char-

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14 Buffon George-Louis-Leclerc, Comte de, "Buffon's Natural History: Of the degeneration of animals [...]", in idem, *Buffon's Natural History: Containing A Theory of the Earth, A General History of Man, Of the Brute Creation, and Of Vegetables, Minerals, [...]*, 10 vols. (London, H.D. Symonds: 1797), vol. x, 341.

15 Schilpp P., *Kant's Pre-Critical Ethics* (Evanston: 1960) 6. Schilpp was concerned to portray the continuity of Kant's earlier and later moral philosophy, taking issue with Menzer P.,

acter of the *Observations on the Beautiful and Sublime*, and the *Dreams of a Spirit-Seer*, as well as the light skepticism of his essays on theodicy, mental disease, and the question whether the earth is aging and declining, are typical of the pre-critical Kant. His own *Universal Natural History* (1755) is a speculative account of the formation of the cosmos and its eventual end, and the mental and moral characteristics of the inhabitants of the other planets. It is already in flat contradiction to Mosaic history and Christian doctrine.

The extant volumes of Buffon's *Histoire Naturelle* were translated into German in 1751 with a preface by Albrecht Haller, and Kant employed Buffon as the basis for his physical geography lectures of 1757 as well as for his *Universal Natural History*.<sup>16</sup> He was influenced by Buffon's evolutionary account of the transformations of the planet, and the relations between physical geography and culture, and he was curious about the psychological traits and tendencies of empirical man. Increasingly, however, Kant was unnerved by naturalism, and especially by the notion he had found in Shaftesbury and Hutcheson and had earlier favoured, namely, that sympathy and the moral sentiments were the basis of morality. Already in the Prize Essay written in 1762, he introduced a distinction between 'necessities' of action which further happiness and necessities which constitute genuine obligations, between formulas of skill and formulas of obligation, a lead-up to the distinction between hypothetical and categorical imperatives. By 1769–1770, the period of the critical turn, Kant was plainly dissatisfied by the remnants of sentimentalism in his moral theory. In one of his *Reflexionen* of the period, he notes that all moral systems are based either on feeling or on reason, and he diagnoses the weakness of both. The moral sense theorists—Hutcheson in particular—introduce a new feeling to explain morality and they, like Epicurus, wrongly 'see in the laws of the senses objective grounds'.<sup>17</sup> The rationalist Wolff, he thought, made the abstract idea of perfection a psychological motive, which it cannot be. By the time of the *Inaugural Dissertation* of 1770, the detachment of Kantian moral theory from sensibility theories was complete. Kant could write that 'moral concepts are not known by experience but by pure intellect [...] pure understanding, pure philosophy'.<sup>18</sup>

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Kants *Lehre von der Entwicklung in Natur und Geschichte* (Berlin: 1911). For some corrective remarks, see Ward K., *The Development of Kant's View of Ethics* (New York: 1972) 175–177.

16 Kant Immanuel, "Entwurf eines Collegii der physischen Geographie", AA II, 3–12, here 4.

17 Kant Immanuel, *Reflexion* 6634, AA XIX, 120, trans. by Schilpp, *Pre-Critical Ethics* 111.

18 Kant Immanuel, *De mundi sensibilis atque intelligibilis forma et principis* (1770) II, 396.

Kant's problem in this regard was not how to reconcile Wolff with Hutcheson—for they were obviously irreconcilable—let alone empiricism with rationalism—but how to defend moral rigorism though 'pure philosophy', since he admitted that an internal psychological motive to moral obedience was missing from the human make-up. To this end, he thought at this stage, it was necessary to confirm the existence of God, the freedom of the will and the immortality of the soul:

That the world has a beginning, that my thinking self is of simple and therefore indestructible nature, that it is free in its voluntary actions and raised above the compulsion of nature, and finally that all order in the things constituting the world is due to a primordial being, from which everything derives its unity and purposive connection—these are so many foundation stones of morals and religion.<sup>19</sup>

A thoroughly grounded metaphysics, he decided, would be dogmatic in resting on these theorems, but it would be preceded by criticism of the powers of pure reason, which Wolff failed to provide:

Metaphysics, as science, must necessarily be developed dogmatically, according to the strictest demands of system, in such manner as to satisfy not the general public but the requirements of the Schools [...] Secure progress of a science is to be attained only through orderly establishment of principles, clear determination of concepts, insistence on strictness of proofs, and avoidance of venturesome, non-consecutive steps in our inferences.<sup>20</sup>

Critique, he said, in the Preface to the second edition of the *Critique of Pure Reason*, has a policing function; its role is not merely negative, that is to say the dismantling of superstition, but also positive, 'to prevent the violence of which citizens stand in mutual fear, in order that each may pursue his business in peace and security'.<sup>21</sup> The rhetoric of danger, perversion, and injury is amplified in the preceding passage. It is

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19 Kant, *Critique of Pure Reason* A466/B494.

20 Ibidem B xxxvi–vii.

21 Ibidem B xxv.

the duty of the Schools, by means of a thorough investigation of the rights of speculative reason, once for all, to prevent the scandal which, sooner or later, is bound to break out among the masses, as the result of the disputes in which the metaphysicians (and, as such, finally also the clergy) inevitably become involved to the consequent perversion of their teaching. Criticism alone can sever the root of materialism, fatalism, atheism, free-thinking, fanaticism and superstition, which can be injurious universally, as well as of idealism and skepticism, which are dangerous chiefly to the Schools, and hardly allow of being handed on to the public.<sup>22</sup>

### 3

The critical turn was accordingly meant to be protective of the public but to require an address to the Schools, written in their language rather than in a popular style. Kant was now prepared to turn the traditional distinction between the sensible and intelligible worlds of Plato, Leibniz, and Wolff into a distinction between the methods and ontological assumptions of the observational, experimental, and speculative sciences and the methods and ontological assumptions of philosophy. The sensible world could be treated in Newtonian fashion as a mechanical system, and the human being could be viewed, anthropologically, as subject to the play of his inclinations, constrained by his local culture, and motivated by his strategies for getting on in the world. But another perspective was available, and Kant declared that we need not, could not, and must not accept the first perspective as exclusive.

Leibniz had presented a metaphysics of two parallel worlds, a phenomenal world that is mechanical and determined by efficient causes, and another hidden noumenal world that is irreducibly vital, mental, and teleologically directed. The phenomenal world appears evil and chaotic in many respects, but, at a deeper level, it is orderly, harmonious, and as good as possible at any given moment. Leibniz had tried to deduce the existence and qualities of the second, invisible world by reasoning about God, thought, substance, and possibility, though also by looking for hints and traces of the hidden world in the phenomenal world. These hints and traces included the absence of perfectly identical objects, the existence of microscopical living creatures, the mathematical coherence and optimality of the laws of motion and of optics, and

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22 Ibidem B xxxiv.

the existence of subconscious perceptions. The monadic entity that is the centrepiece of his system was the product of a set of critical reflections on the inadequacy of physical atomism.

Kant rejected not only the monadology as Leibniz depicted it, with its arbitrary, fanciful elements, but the analytical method Leibniz employed to justify it. His own hidden world is revealed by a different method of argumentation, and it differs from Leibniz's, insofar as Kant's aim in depicting it was not to promote a sense of overall satisfaction with things as they are whilst defending and perhaps stimulating a spirit of invention and discovery, but to advance his moral and political purposes. His moral purpose was to show that humans were (that is to say, could and must be considered) morally competent in virtue of being free to choose to do good and obliged to act rightly in virtue of their reason. His political purpose was to show that the oppression of civilization was necessary to the development of culture, and that warfare and conquest were (that is to say, could and must be considered) self-limiting conditions that would bring about a world of universal peace and commerce as unruly elements were subjugated and as national treasuries were exhausted by wars between the civilized. It was important for both purposes to defend against the speculative hypotheses that all living creatures were the results of chance and the laws of nature, that no transcendent creator had been involved in their production or generation, and that human beings were a variety of clever ape with no special moral or metaphysical status.

The rigorous, School-satisfying argumentation Kant decided to employ departed from the ubiquitous claims for the unknowability of matter or 'substance' and the ultimate causes of physical forces, including gravity and vitality. Such claims were a commonplace of seventeenth and eighteenth century post-Cartesian epistemology; Gassendi,<sup>23</sup> Locke<sup>24</sup> and the Newtonians<sup>25</sup> had all emphasized them, and Haller, in his introduction to the German translation of Buffon's *Histoire Naturelle*, does so as well, emphasizing the difference between the known elements of mathematics which permit the mathematician to construct his proofs, and the unknown elements of physical nature:

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- 23 Gassendi Pierre, *Objections* v, in Adam C. – Tannery P. (eds.), *Oeuvres de Descartes*, 11 vols. (Paris: 1964–1974) vol. VII, 266.
  - 24 Locke John, *An Essay Concerning Human Understanding*, ed. P.H. Nidditch (Oxford: 1975) 295–296.
  - 25 Wilson C., "Newtonian Matter Theory", in Mandelbrote S. – Pulte H. (eds.), *The Reception of Newton in Europe* (New York), forthcoming.

[M]ost of the bodies which constitute Nature, and the motions which constitute its inherent force, are unknown to us [...] The elements of bodies are completely hidden. The first seeds of matter, the primeval forces of gravity, elasticity, electrical and magnetic essences, light and fire, are only known to us on occasion, and in an incomplete and piecemeal way.<sup>26</sup>

Gassendi and Locke, as adherents of the atomist or corpuscularian philosophy, nevertheless assumed that experiences were caused by matter, and Gassendi considered the perceptive and perhaps the reasoning soul to be material as well, a view Locke hesitated to endorse but declared to be possible. Both denied that the existence of a Cartesian incorporeal soul was established by reasoning.

Kant took a different tack, adopting the same substance-agnostic starting point, but retaining a parallel structure for thought and matter, each of which he supposed had a noumenal correlate, necessarily unavailable to experience, yet theoretically required as the ground of the two sets of physical and mental phenomena. Physics dealt systematically with the appearances, not their unknown substratum. For a 'transcendental idealist', which Kant declares himself to be in the first edition of the *Critique of Pure Reason*, what we call matter is 'only a species of representations (intuition), which are called external [...] because they relate perceptions to the space in which all things are external to one another, while yet the space itself is in us'.<sup>27</sup> Further,

[m]atter [...] does not mean a kind of substance quite distinct and heterogeneous from the object of inner sense (the soul), but only the distinctive nature of those appearances of objects—in themselves unknown to us—the representations of which we call outer [...]. They have, indeed, this deceptive property that, representing objects in space, they detach themselves as it were from the soul and appear to hover outside it. Yet the very space in which they are intuited is nothing but a representation[.]<sup>28</sup>

While the dogmatic insistence on the existence of an incorporeal soul and free will was precluded by the critical philosophy, our ignorance entitles us to postulate, he said, against the equally indemonstrable claims of the materialist,

26 Haller Albrecht, "Buffon on Hypotheses: The Haller Preface to the German Translation of the *Histoire Naturelle* (1750)", in Lyons J. – Sloan P.R. (trans. and eds.), *From Natural History to the History of Nature* (London: 1981) 300.

27 Kant, *Critique of Pure Reason* A 370.

28 Ibidem, A 385.



that our body may be nothing more than a fundamental appearance which in this our present state (in this life) serves as a condition of our whole faculty of sensibility, and therewith of our thought, and that separation from the body may therefore be regarded as the end of this sensible employment of our faculty of knowledge and the beginning of its intellectual employment. Thus regarded, the body would not be the cause of thought, but merely a restrictive condition of it, and therefore, while indeed furthering the sensible and animal life, it would because of this very fact have to be considered a hindrance to the pure and spiritual life. The dependence of the animal and sensible upon the bodily constitution would then in nowise prove the dependence of our entire life upon the state of our organs.<sup>29</sup>

Having abandoned the assumption that the mind was likely material, whilst accepting the existence of a range of inscrutable forces in nature, Kant could argue that there was no reason, even if one steered clear of all theological assumptions, to suppose that life had arisen through mechanical-chemical combinatory processes, or to regard the human being as a machine, even a very complex and delicate machine. His rejection of naturalism as applied to life and thought took the following forms:

First, Kant attacked the most current version of materialism, hylozoism (which covered Buffon's organic molecules as well as Maupertuis's theory of living matter), as incoherent—'the death of all natural philosophy'.<sup>30</sup> Second, he urged that causal relations pertained to the appearances only, and so to the 'empirical character' of human actions, while their intelligible character was excluded from the chain of causes since, strictly speaking, 'nothing happens' in the *noumenon*. The denial of freewill was therefore purely dogmatic, and freewill was not only thinkable but necessary if the moral concepts that, on his view, were cognitively and pragmatically indispensable were to be well grounded. Third, Kant argued that because nature had endowed humans with reason, in addition to the instinct and emotion that guided all other animals in their strategies for living, the theory of moral sentiments was misguided.<sup>31</sup> The impression of ineluctable duties and the reverence for the moral law that

29 Ibidem, A 778–9/B 806–7.

30 Kant Immanuel, *Metaphysische Anfangsgründe der Naturwissenschaft* (1786) AA IV, 544; cf. Kant Immanuel, *Critique of Judgement*, trans. W.S. Pluhar (Indianapolis: 1987 [1790]) AA V, 395.

31 Kant Immanuel, *Grundlegung zur Metaphysik der Sitten* (1785) AA IV, 395.



characterized the normal human conscience, though they were not always operational, were not pathological emotions, mere characteristics of the human social animal, but intrinsically connected with human exceptionalism. These denials enabled him to assert the exclusivity of sentimental motives and genuinely moral motives, and to allow religious faith a role in supporting and strengthening the latter.

Ultimately, Kant envisioned a scheme that, as the counterpart to the merely descriptive and particular studies of plant and animal species, of the physiques, manners, and mores of different cultures, and of the contingencies of the historical and geological record, would be systematic. It would address the question of the significance of human life, and the moral potential of human beings that was not evident from empirical studies, and that was indeed undermined by them. The rationality and moral conscience of human beings that distinguished them from other animals made the parallel story both possible and necessary. It was possible because of the incompleteness of materialism and necessary because no full account of humanity could ignore the contributions of these two attributes and because reason strives for the answer to practical, or as we would say 'existential', as well as to empirical questions. Kant's demand for systematicity, not only in the axiomatization of physics and the classifications of natural history, but in philosophy is expressed as follows:

what is peculiarly distinctive of reason in its attitude to [...] knowledge, is that it prescribes and seeks to achieve its systematization, that is, to exhibit the connection of its parts in conformity with a single principle. This unity of reason always presupposes an idea, namely, that of the form of a whole of knowledge—a whole which is prior to the determinate knowledge of the parts, and which contains the conditions that determine a priori for every part its position and relation to the other parts.<sup>32</sup>

The obligation to think of the world as progressing towards a better state, a condition of peaceful harmonious co-existence, was a moral one. Respect for humanity, Kant thought, demands that we regard the individual as predisposed to moral development and the species as predisposed to cultural and political maturation rather than as equally liable to improvement or degeneration as the Buffonian pessimist supposed. The obligation to think in this manner was possible to fulfil in the absence of any knowledge of how the human race had come into existence and what its future held. In the *Critique of Judgement*, Kant

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<sup>32</sup> Kant, *Critique of Pure Reason* A645/ B673.

expressed his sense of the cruelty and indifference of nature, and his view that the inner fortitude of the Spinozist is insufficient to cope intellectually with it:

Deceit, violence, and envy will always be rife around him [...]. Moreover, as concerns the other people he meets: no matter how worthy of happiness they may be, nature, which pays no attention to that, will still subject them to the evils of deprivation, disease and untimely death, just like all the other animals on earth. And they will stay subjected to these evils always, until one vast tomb engulfs them one and all [...] and hurls them, who managed to believe that they were the final purpose of creation, back into the abyss of the purposeless chaos of matter from which they were taken.<sup>33</sup>

His revisionary metaphysics of experience enabled Kant to reintroduce teleology as necessary to sciences of life and to the interpretation of history. The presence in our world of plants and animals could never be explained by reference to chance and mechanical laws. Both the beauty of nature and the economy and adaptations of the animal body oblige us to think in terms of a benevolent designer who cares for his creatures and who desires to delight us with living forms. However, the existence of such a designer is indemonstrable and there may in fact be no such person. Nor is there any necessary connection between the idea of a creator-God and the idea of a judging God. But the experience of beauty indicates that we are adapted to the natural world just as we would have been had God created it to gratify us, and this notion, Kant thought, should be a stimulus to hope and morality.

#### 4

'Kant is revered', according to Onora O'Neill, 'for his unswerving defense of human freedom and respect for persons', even when his metaphysics is deplored and the derivations of duty that are linked to it are deemed vapid or repellent.<sup>34</sup> On O'Neill's highly original account, the real underlying purpose of the First Critique is to defend the prerogative of free citizens, employing reason, over superstition and arbitrary authority, and its metaphysics should

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33 Kant, *Critique of Judgement* AA V, 452.

34 O'Neill O., *Constructions of Reason: Explorations of Kant's Practical Philosophy* (Cambridge: 1989) ix.

accordingly be read sympathetically.<sup>35</sup> But Kant's concrete, applied conception of freedom and respect for persons pales by comparison with that of many of his contemporaries. As John Zammito remarks, in advancing his systematic programme, Kant was oddly out of step with and resistant to the more progressive currents of his time.<sup>36</sup>

Social equality, for example, was extensively theorised in Franco-Scottish philosophy in which the historical origins of the class system were held up for examination and criticism, and the enslavement and extinction of tribal cultures was deplored. While Rousseau's *Discourse on the Origins of Inequality* was widely regarded as absurd and exaggerated, the critique of arbitrary power and the pessimism that the evolutionary account implied was indispensable to the more modest proposals of the *Social Contract*. Such thoroughgoing equality and free, rational participation as Rousseau envisioned was very far from Kant's mind, nor had he an unblinking commitment to leaving native cultures to their own devices on the grounds of respect for persons. Nature's purpose must be the advance of culture, by which Kant meant the increasing sophistication of taste and the refinement of manners, as well as the growth of scientific knowledge.

The uniqueness of human beings amongst other living species resides in both their technical, 'mechanical' competence, their ability to use and exploit other humans in the organized state, and in their moral competence. A note from the 1780s asks:

What is the natural purpose of Humanity? The highest culture—What is the condition of its realization?—Bourgeois society. What is its motor?—Hostility and jealousy. Labour. What is the rational purpose [of Humanity]?—Morality. To what does it lead?—Opulence [*Wohlleben*] in freedom.<sup>37</sup>

Culture is accordingly a natural developmental process that unfolds in the human collective with a certain inevitability. Cultural progress is not to be identified with moral progress, though both morality and culture are departures from nature that repudiate and transcend bare animal existence and—of course—sensuality. Even where civilization appears overtly refined and vain or hypocritical, says Kant, it 'makes headway against the crudeness and

35 Ibidem, 15–27.

36 Zammito J.A., *The Genesis of Kant's Critique of Judgment* (Chicago: 1992) 190.

37 Ibidem, 323–325.

vehemence of those inclinations that belong to us primarily as animals and that interfere most with our education for our higher vocation'. Science and art 'make great headway against the tyranny of man's propensity to the senses, and so prepare him for sovereignty in which reason alone is to dominate'.<sup>38</sup>

The development of culture proceeds with disregard for or in the absence of happiness. It requires discipline:

the liberation of the will from the despotism of desires, a despotism that rivets us to certain natural things and renders us unable to do our own selecting; we allow ourselves to be fettered by the impulses that nature gave us only as guides so that we would not neglect or even injure our animal characteristics[.]<sup>39</sup>

And culture requires skill. This development of skill in turn is hard to further 'except by means of inequality among people'. It brings about class unrest, oppression, hard labour and little enjoyment, because 'the majority take care, mechanically, as it were and without particularly needing art for this, of the necessities of life for others, who thus have ease and leisure to work in science and art, the less necessary ingredients in culture'. And yet, says Kant, this 'shining misery has to do with the development of man's natural predispositions, and so nature still achieves its own purpose, even if that purpose is not ours'.<sup>40</sup>

## 5

To summarize, Kant's epistemological interests were not merely parallel to but subservient to his normative interests. Finding 'foundations' for Newtonian physics was not so much a gift to eighteenth century Newtonians showing their physics to be well-founded as it was a means of sidelining materialism and restricting its pretensions. The 'critical turn' was not, as is sometimes said, a turn against School metaphysics precipitated by the empiricist Hume, for Kant was already a critic of School metaphysics and aligned with the observational and naturalistic schools in his early career. His project was rather a reclamation of metaphysics, a providential and morally deontological view of

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38 Kant, *Reflexion* 1521 AA XV, 885. See Kleingeld P., "Kant, History, and the Idea of Moral Development", *History of Philosophy Quarterly* 16, 1 (1999) 59–80. Cf. Kant, *Critique of Judgement* AA V, 433.

39 Ibidem, 432.

40 Ibidem, 431–432.

the universe, intended to meet the demands of the Schools for argumentative rigour and to take the next step in German metaphysical thinking about the traditional subjects of God, the soul, and the world. So the First Critique is meant to persuade the reader that the mechanical image of the world is our projection conditioned by our minds and that Newtonian physics cannot pretend to be an exhaustive account of the world as it is in itself; that we are not trapped in the causal nexus. The Second Critique is meant to show that there are spurs to morality in the human mind that do not reduce to the states of sympathy, benevolence, and fear that can be empirically studied. The Third Critique is meant to show that although the doctrine of hexaemeral creation and God's historical agency and providential care have to be rejected, nature has given us hints through her beauty, though the appearance of human beings on earth, and through the evidence of building forces constantly at work in nature, that pessimism is unwarranted.

We should accordingly take Kant at his word. His targets were materialism, naturalism, and fatalism, doctrines which were advocated neither by the rationalists Leibniz and Wolff (determinists, perhaps, but hardly materialists); nor by Locke (neither a fatalist nor a determinist); nor by the skeptical Hume of the epistemological sections of the *Treatise* and the *Enquiry*. The dangerous 'isms' were rather the constructions of La Mettrie, Holbach, the Hume of the *Dialogues*, Priestley, Maupertuis, Buffon and the Encyclopedists, Spinoza, and Herder. Their investigations of nature as a self-fashioning entity and man as a part of nature favoured a utilitarian and hedonistic, sometimes even a libertine approach to morals, and they had found no evidence of a guiding hand or an immanent telos in human history. The tragedy of militarism, of conquest and subordination, had no redeeming features for the Encyclopedists.<sup>41</sup> The idealistic turn—against the Franco-Scottish materialists, sentiment-theorists, and conjectural historians—strongly influenced the course of nineteenth century philosophy with its pronounced idealistic character, and its militaristic teleology of history.<sup>42</sup>

The hypothesis that Kant's critical philosophy is a response to the 'other' critical philosophies, advocated by those who rejected theologically-imbued

41 In this connection, Diderot's political writings and his work on the Abbe Raynal's (proscribed) *Histoire philosophique des deux indes*, 6 vols. (Amsterdam: 1770) have a special significance. See Richter M., "The Comparative Study of Regimes and Societies", in Goldie M. – Wokler R. (eds.), *The Cambridge History of Eighteenth-Century Thought* (Cambridge: 2006) 165–168.

42 Berlin I., "Kant as an Unfamiliar Source of Nationalism", in Berlin I., *The Sense of Reality* (New York: 1997) 232–248.

school philosophy more decisively than Kant did, explains the unity of Kant's revisionary programme and his distinctive expository style. He wanted to preserve the rigour and systematicity of school metaphysics, while avoiding its references to the supersensible as far as possible. As well, the hypothesis explains the conjunction in Kant's successor Hegel of an idealist metaphysics with an optimistic philosophy of history, according to which Spirit reveals itself progressively and war is the instrument of the advance of culture, as Kant himself believed. It accounts as well for other unappealing aspects of his normative theory, his fixed belief that man needs a master and that the purpose of the state is to ensure freedom, not happiness. His well-documented antifeminism is closely related to his programme rather than being merely, as apologists have argued, a prejudice he shared with his contemporaries. For respect for women and their capabilities and an interest in to engaging them and with them in intellectual culture was characteristic of vital materialists, including Diderot and Herder. To Kant, the machine of nature runs alongside transcendental purposes but is not to be confused with it. The cycle of matings and generations that perpetuates the species, for which women are conspicuously responsible, appears absurd if we consider the purpose of humanity.<sup>43</sup> But it is the necessary condition of the advance of culture, which requires multiple generations for the accumulation and transmission of knowledge. Women did not and could not for Kant represent humanity in the process of developing to its full perfection. They could contribute to culture by exhibiting taste and refinement, and to discipline through sexual restraint, but not by creating art and science, the higher forms of skill.

Innovative in Kant is the complicated methodological framework involving a largely new vocabulary for metaphysics and the spectacular balancing act between unknowability and the demands of reason that he invoked to defend his values in a manner that could withstand the critical approach to beliefs and institutions implied by the theory of nature, as it had evolved in the eighteenth century life sciences and anthropology. Regrettably, Kant kept his distance from a form of Enlightenment optimism—the hope of greater social equality and a reduction of human misery, and the expectation of an unapologetically secular foundation for ethics. His commitment to freedom and his defense of essential human interests have accordingly little to do with the great liberation movements of the twentieth century. His understanding of 'freedom' relates, to be sure, to the opening of offices to the bourgeoisie, but he was more concerned with the reduction of the power of theology faculties

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43 Kant, *Critique of Pure Reason* A 779/B 807.

and to the broadening of moral accountability than with democracy and social equality. Though good use can be and has been made since of the Kantian moral framework, an adequate understanding requires the historian to recognise and depict a Kant who was a revisionary metaphysician with a deeply personal and not altogether appealing agenda.

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